

WO 2005/017148

PCT/US2003/041600

ggtgatacttctacaatcagaagtcaaggccaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggctctattctgtgcaagagtggtgtactatagtaactcttactgggtactcagatgtctggggcac
agggaccacggtcaccgtctctctgatcaatccaactctgaagaagcaagaaaggaggagccaaaaaggaggaagccaaga
aatctaacagcgtcgacattgtctgactcagctccagccaccctgtctgtgactccaggagatagagtctctcttctgcaggggcc
5 agccagagtattagcgactactacactgggtatcaacaaaaatcacatgagctctcaaggcttctcatcaaatatgcttccattccatc
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caggatctctgcaaggcttctgggtatgccttcacaactactggaatgcagtggtgcaagagatgccaggaaagggttgagt
10 ggattggctggataaacaccccactctggagtgcacaaatgtagaagacttcaaggacggttgccttctcttggaaacctctgc
caacactgcatatttacagataagcaacctcaagatgaggacacggctacgtatttctgtgtgagatccgggaatgttaactatga
cctggcctactttgcttactggggccaaggacactggcactgtctctgatcaggagcccaaatctctgacaaaactcacacatcc
ccaccgtccccagcacctgaactcctgggggatcgtcttctcttcccccaaaacccaaggacacctcatgatctcccg
gacccctgaggtcacatgcgtgggtgggtgacgtgagccacgaagacctgaggtcaagttcaactgggtacgtggacggcgtgga
15 ggtgcataatgccaagacaaagccgcgggaggagcagtlacaacagcacgtaccgtgtggtcagcgtctcaccgtcctgcacca
ggactggctgaatggcaaggagtacaagtgaaggcttccaacaaagccctccagccccatcgagaaaacaatctccaaagc
caaagggcagccccgagaaccacaggtgtacacctgccccatcccggtgagctgaccaagaaccaggtcagcctgacct
gcctgggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacg
cctcccggtgctggactccgacggctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggggaacgtct
20 tctcatgctccgtgatgcatgaggtctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatclaga

2H7-antiCD40 scFv MTH (SSS) MTCH2WTCH3 (2H7-40.2.220Ig) (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSPGGEKVTMTCRASSSVSYMHWY
25 QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKGGGGSGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYSNSYWFYFDVWGTGTTVTVSSDQSNSEEAK
KEEAKKEEAKSNSVDIVLTQSPATLSVTPGDRVSLSCRASQSISDYLHWYQQKSH
30 ESPRLLIKYASHSISGIPSRFSGSGSGSDFTLINSVEPEDVGIYYCQHHGHSFPWTFGG
GTKLEIKRGGGGSGGGSGGGGSIQLVQSGPELKKPGETVRISCKASGYAFTTTG
MQWVQEMPGLKGLKWIGWINTPLWSAKICRRLQGRFAFSLETSANTAYLQISNLKD

WO 2005/017148

PCT/US2003/041600

EDTATYFCVRSNGNYDLAYFAYWGQGLVTVSDQEPKSSDKTHTSPSPAPPELL
GGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTK
PREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRE
PQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPVLDSD
5 GSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

5B9 VH (includes the VH leader peptide) (nucleotide sequence) (SEQ ID NO: __)

atggctgtcttggggctgctcttgcctggtagacattccaagctgtgcctatcccaggtgcagctgaagcagtcaggacctggcc
tagtgacgtcctcacagagcctgtccatcacctgcacagctctgtgttctcattaactacctatgtgtacactgggtcggcagtc
10 caggaaagggctgtggagtggtggagtgatggagtggtggaatcacagactataatgcagcttccatccagactgagcatc
accaaggacgattccaagagccaagtttctttaaataaacagctgcacacctaataacacagccatttattactgtgccagaaatg
ggggtgataactacccttattactatgctatggactactgggggtcaaggaacctcagtcaccgtctcctca

5B9 VH (minus the leader) (nucleotide sequence) (SEQ ID NO: __)

cagggtgcagctgaagcagtcaggacctggcctagtgacgtcctcacagagcctgtccatcacctgcacagctctgtgttctcatta
actacctatgtgtacactgggtcggcagtcctcaggaaagggctgtggagtggtgggtggagtgatggagtggtggaatcacaga
ctataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctttaaataaacagctgcacaccta
atgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatggactactggggicaaggaacctca
gtcaccgtctcctca

20

5B9 VH (includes leader peptide) (amino acid sequence) (SEQ ID NO: __)

MAVLGLLFCLVTFPSCVLSQVQLKQSGPGLVQSSQSLSTCTVSGFSLTTYAVHWV
RQSPGKGLEWLGVIWSSGITDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDTAIY
YCARNGGDNYPYYYAMDYWGQGSVTVSS

25

5B9 VH (no leader peptide) (amino acid sequence) (SEQ ID NO: __)

QVQLKQSGPGLVQSSQSLSTCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSSGI
TDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDTAIYYCARNGGDNYPYYYAMDY
WGQGSVTVSS

30

WO 2005/017148

PCT/US2003/041600

5B9 VL (nucleotide sequence) (SEQ ID NO: __)

atgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgaggctgcattctc
caatccagtcactcttgaacatcagcttccatctctcaggtctagtaagagtctcctacatagtaatggcatcactatttgattgg
tatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcccagacaggttcagtagca
5 gtgggtcaggaactgatttcacactgagaatcagcagagtggaggctgaggatgtgggtgtttattactgtgctcaaatctagaact
tccgctcacgttcggtgctgggaccaagctggagctgaaacgg

5B9 VL (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
10 LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKR

5B9 scFv (nucleotide sequence) (SEQ ID NO: __)

aagcttccgccatgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgca
15 ggctgcatttccaatccagtcactcttgaacatcagcttccatctctcaggtctagtaagagtcctacatagtaatggcatca
cttatttgattggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcccagaca
ggttcagtagcagtggggtcaggaactgatttcacactgagaatcagcagagtggaggctgaggatgtgggtgtttattactgtgctc
aaaatctagaacttccgctcacgttcggtgctgggaccaagctggagctgaaacggggtggcgtggctcgggcgggtgggtgggt
cgggtggcggcggtatgacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagacctgtccatcacct
20 gcacagtctctggtttctattaactacatgctgtacactgggttcgccagctctccaggaaagggtctggagtggctgggagtgat
atggagtgtggaatcacagactataatgcagctttcatatccagactgagcatcaccagacgattccaagaccaagttttctt
aaaatgaacagtctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactggggtcaaggaacctcagtcaccgtctcctct

25 5B9 scFv (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVWSGKITDYNAAFISRLSITKDDSK
30 SQVFFKMNSLQPNDAIYYCARNGDNYPIYYAMDYWGQGTSVTVSS

WO 2005/017148

PCT/US2003/041600

5B9 scFv-hmflgG1-hCD80 (nucleotide sequence) (SEQ ID NO: __)

aagcttcccgcacatgaggttctctgctcagcttctggggctgcttgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggctagtaagagtcctacatagtaaatggcatca
5 cttatttgattggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaaccttgcctcaggagtcaggagaca
ggttcagtagcagtgggtcaggaaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttattactgtgctc
aaaatctagaacttccgctcacgttcgggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt
cgggtggcggcgatgctcacagggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
gcacagctctggtttctattaactacatgctgtacactgggttcgccagcttccaggaaagggtctggagtggtgggagtgat
10 atggagtggtggaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttcttt
aaaatgaacagctctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactgggtgcaaggaacctcagtcaccgtctcctctgatctggagcccaaatctctgacaaaactcacacaagcccaccgagcc
cagcacctgaactcctggggggatgctcagctctcctctccccccaaaacccaaggacacctcatgatctcccgaccctgag
gtcacatgcgtggtgggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
15 gccaaagacaaagccgcgggaggagcagtlacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggct
gaatggcaaggagtlacaagtgaaggtctccaacaaagccctcccagcccccatcgagaaaaccatctccaaagccaaagggc
agccccgagaaccacagggtgacacctgcccccalcccgggatgagctgaccaagaaccaggtcagcctgacctgcttgcgtgca
aaggcttctatccagcgacatcgccgtggagtgaggagcaatgggcagccgggagaaactacaagaccacgcctcccgtg
ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggaacgtcttctcatgctc
20 cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaagcggatccttgaacctgctcc
catcctgggccattaccttaatctcagtaaatggaatttttgatgatgctgcctgacctactgctttgccccaaagatgcagagagaga
aggagggaatgagagattgagaagggaagtgtacgcctgtataaatcgatactcgag

5B9 scFv-hmflgG1-hCD80 (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPPYYAMDYWGQGTSTVTVSSDLEPKSS
30 DKTHTSPPSPAPPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP

WO 2005/017148

PCT/US2003/041600

ENNYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSVMHEALHNHYTQKSLS
LSPGKADPSNLLPSWAITLISVNGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

2e12 scFv WTH CH2 CH3 (2e12 scFv-WthIgG-CD80) (nucleotide sequence) (SEQ

5 ID NO: __)

aagcttatggattttcaagtcagattttcagcttctgctaatacagtgcttcagtcataatgtccagaggagtcgacattgtgctcacc
aatctccagcttctttggctgtgtctctaggtcagagagccaccatctctgcagagccagtgaaggtgtgaatattatgcacaagtt
taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcaccaacgtagaatctggggtccctgcc
aggtttagtggtcagtggtgtggacagacttcagcctcaacatccatcctgtggaggaggatgataatgcaatgtatttctgtcagc
10 aaagtaggaaggttcttgacgttcggtggagggaccaagctggaaatcaaacggggtggcgggtggtcggcgagggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctggtggcgccctcacagagcctgtccatcacatgc
accgtctcaggggttctaltaaccggctatggtgtaaactgggttcgccagcctccaggaaagggtctggagtggctgggaatgat
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aaaaatgaacagctctgcaaactgatgacacagccagataclactgtgccagagatggttatagtaactttcattactatgttatggact
15 actggggtcaaggaaacctcagtcaccgtctcctcagatctggagcccaaatcttgacaaaactcacacatgccaccgtgccca
gcacctgaactcctggggggaccgtcagcttctcttcccccaaaacccaaaggacacctcatgatctccggacctctgaggt
cacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgc
caagacaaagccggggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctga
atggcaaggagtacaagtcaaggctccaacaagccctccagcccccatcgagaaaacctctccaaagccaaagggcag
20 ccccgagaaccacaggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgtaaa
ggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgct
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gtgatgcatgaggtctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaacgggatccttgaacctgctccc
atcctgggccattacctaattctcagtaaatggaattttgtgatatgctgcctgacctactgctttgccccaaagatgcagagagagaa
25 ggaggaatgagagattgagaagggaaggtgtacgcctgtataaatcgat

2e12 scFv WTH CH2 CH3 (2e12 scFv-WthIgG-CD80) (amino acid sequence) (SEQ
ID NO: __)

MDFQVQIFSLLISASVIMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
30 LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKLEIKRGGGGSGGGSGGGGSQVQLKESGPGLVAPSQSLS
ITCTVSGFSLTGYGVNWVRQPPGKGLEWLGMIWGDGSTDYNSALKSRLSITKDNS

WO 2005/017148

PCT/US2003/041600

KSQVFLKMNSLQTDDTARYYCARDGYSNFHYVMDYWGQGTSTVTVSSDLEPKS
CDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFN
WYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALP
APIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQ
5 PENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSQVMHEALHNHYTQKSL
SLSPGKADPSNLLPSWATLISVNGIFVICCLTYCFAPRCRERRRRNERLRRESVRPV

2H7-human IgE Fc (CH2-CH3-CH4) (nucleotide sequence) (SEQ ID NO: __)

aagcttccgccatggatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaattgttctct
10 cccagctccagcaatcctgtctgcattccaggaggagaaggtcacatgactgcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggatcctccccaacccctggatttatccccatccaacctggcttctggagtcctctgctcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgaggagctgaagatgctgccacttattactgccagcagtgaggatt
taaccacccacgttcggtgctgggaccaagctggagctgaaagggtggcggctggcggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctggggctgagctgtgaggcctggggcctcagtgagatgctctgcaaggcttctggc
15 tacacatttaccagttacaatatgcactgggttaaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgtactatagtaacttactggtagcttcgatgtctggggcac
agggaccacggtcaccgtctctgatcacgtctgctccagggaattcaccccgccaccgtgaagatcttacagtcgtctgcgacg
gcggcggggcacttcccccgacctccagctcctgtgcctcgtctctgggtacacccagggaactatcaacatcacctggctgga
20 ggacgggcaggtcatggacgtggactgtccaccgcctctaccacgcagggaggtgagctggcctccacacaaagcgagctca
ccctcagccagaagcactggctgtcagaccgcactacacctgccaggtcacctatcaaggtcacacctttgaggacagcaccac
gaagtgtcagattccaacccgagaggggtgagcgctacctaagccggccagcccgttcgacctgttcacccaagtgcgc
cacgatcacctgtctggtggtggacctggcaccagcaaggggaccgtgaacctgacctggctccggggcagtggaagcctgt
gaaccactccaccagaaaggaggagaagcagcgcaatggcacgttaacctgcacgtccaccctgccggtgggcacccgagact
25 ggatcaggggggagacctaccagtgcagggtgacccacccccacctgccaggggcctcatgggtccacgaccaagaccag
cgcccgctgctgctcccggaagtctatgcgtttgcgacgccggagtggccggggagccgggacaagcgacacctgcctgc
ctgatccagaactcatgcctgaggacatctcgttgagtgagtgacacagaggtgcagctcccgagcggccggcacagcacg
acgcagccccgaagaccaagggtccgcttctcgtctcagccgcctggaggtgaccagggccgaatgggagcagaaaga
tgagttcatctgccgtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcggtgtctgtaaatcccgtaaatgat
30 aatctaga

WO 2005/017148

PCT/US2003/041600

2H7 scFv IgE (CH2-CH3-CH4) (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 FNPPTFGAGTKLELKGGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
 5 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSDHVCSDFTP
 PTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQE
 GELASTQSELTLSQKHWLSDRITYTCQVTYQGHTFEDSTKKCADSNPRGVSAAYLSR
 PSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLTV
 10 TSTLPVGTTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEWP
 GSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRLE
 VTRAEWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

2H7 scFv MH (SSS) MCH2WTCH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgcegccatggatttcaagtcagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
 ccagctccagcaatctgtctgcatctccaggggagaaggtaacaatgactgcagggccagctcaagttaagtacatgcact
 ggtaccagcagaagccaggatcctccccaaccctggatttatgcccacccaacctggcttcggagtcctgctcgttcagtg
 gcagtggtctgggacctcttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggatt
 taacccaccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtggatctggaggaggtg
 20 ggagctctcaggcttatctacagcagctctggggctgagctggtgagcctggggcctcagtgaaatgctctgcaaggctctggc
 tacacattaccagtacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaaat
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 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactggtacttcgatgctcggggcac
 agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtccccagcacctgaac
 25 tcttgggggatcgtcagcttctcttcccccaaaaccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
 gtggtggacgtgagccacgaagacctgaggtcaagttcaactggtagctggacggcgtggaggtgcataatgccaagacaaag
 ccgctggaggagcagtaaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
 gtacaagtcaaggctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac
 cacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaaggcttctatcc
 30 cagcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgcctcccgctgctggactccgac
 ggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
 ggctctgcacaaccactacacgcagaagagcctctccctgtctccggtaaatgatctaga

WO 2005/017148

PCT/US2003/041600

2H7 scFv MH (SSS) MCH2WTCH3 (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 5 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFVDVWGTGTTVTVSSDQEPKSSDK
 THTSPSPAPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
 10 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
 PGK

5B9 scFv MTHWTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgccgcatgaggttctctgctcagcttctggggctgcttgctctggatccctggatccactgcagatattgtgacgca
 ggctgcatctccaatccagtcactcttgaacatcagcttccatctctgcaggtctagtaagagctcctacatagtaatggcatca
 ctatttgtattggtatctgcagaagccaggcagctcctcagctcctgattatcagatgtccaacctgcctcaggagtcccagaca
 ggticagtagcagtggtcaggaactgattcacactgagaatcagcagagtgagggtgaggatgtgggtgttattactgtgtc
 aaaatctagaactccgctcacgttcggtgctgggaccaagctggagctgaacgggggtggcgggtggctcgggcgggtgggt
 20 cgggtggcggcgatcgtcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
 gcacagtctctggttctcattaactacatgctgtacactgggttcgacgtctccaggaaagggtctggagtggctgggagtat
 atggagtgggtgaatcacagactataatgcagcttcatatccagactgagcatcaccaaggacgattccaagagccaagtcttctt
 aaaatgaacagtctgaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
 ctactggggtaaggaacctcagtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcccc
 25 agcacctgaactcctggggggaccgtcagctctctcttcccccaaaaccaaggacacctcatgatctccggacctgag
 gtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
 gccaaagacaaagccggggaggagcagtaacagcacgtaccgtgtggtcagcgtctcaccgtcctgcaccaggactggct
 gaatggcaaggagtacaagtgaaggtctccaacaaagccctcccagccccatcgagaaaacaatctcaaagccaaagggc
 agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagctgacctgctgtgta
 30 aagcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaaacaactacaagaccacgcctccgtg
 ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
 cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

WO 2005/017148

PCT/US2003/041600

5B9 scFv MTHWTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSNGITY
LYWYLQKPGQSPQLLIYQMSNLAAGVPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
5 AQNLELPLTFGAGTKLELKRGGGGSGGGGSGGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSSGGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSVTVSSDQEPKSS
DKTHTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
10 PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP
ENNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLS
LSPGK

Human IgG1 hinge mutations

2H7 scFv- MTH (CSS) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgccgccatggatttcaagtcagattttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
cccagctccagcaatcctgtctgcattccaggggagaaggtcacatgactgcagggccagctcaagtgttaagttacatgcact
ggtagcagcagaagccaggatcctccccaaccctggatttatgccccccaacctggcttctggagtcctgtcgttcagtg
gcagtggtgtgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccattattactgccagcagtgaggatt
20 taaccacccacgttcggtgtgggaccaagctggagctgaagatggcgggtggctcgggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctcggggtgagctggtagggcctggggcctcagtgagatgtcctgcaaggctctggc
tacacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctattatccaggaaat
ggtagacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcgggtctatttctgtgaagagtggtgtactatagtaactcttactggtagctctgatgtctggggcac
25 agggaccacggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcccagcacctgaac
tcttggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtgtgggacgtgagccacgaagacctgaggtcaagttcaactggtagctggagcggcgtggaggtgcataatgccaagacaaag
ccgcgggaggagcagtacaacagcagctaccgtgtgtgtagcgtcctcaccgtctgcaccaggactggctgaatggcaagga
gtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctcaaagccaaagggcacccccgagaac
30 cacaggtgtacacctgcccccatcccggtgatgagctgaccaagaaccaggtcagcctgacctgctgtgcaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccgctgtggactccgac

WO 2005/017148

PCT/US2003/041600

ggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgttctcatgctccgtgatcatga
ggctctgcacaaccactacacgcagaagagcctctccctgtctccggtaaatgatctaga

2H7 scFv- MTH (CSS) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

5 MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFVDVWGTGTTVTVSSDQEPKSCDK
10 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
PGK

15

2H7 scFv- MTH (SCS) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

aagcctgccgccatggatttcaagtcagatttcagcttctgctaatacagtgcttcagtcataatgccagaggacaaatgttctct
cccagctccagcaatcctgtctgcctccaggggagaaggtcacatgactgcagggccagctcaagtgttaagttacatgcact
ggtagcagcagaagccaggatcctcccccaccctggattatgccccatccaacctggcttctggagtcctgctcgttcagtg
20 gcagtggtgtgggacctcttactctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgtgggaccaagctggagctgaagatggcgggtggctggcggtgggtgagctggaggaggtg
ggagctctcaggcttattctacagcagctcggggtgagctggtaggcctggggcctcagtgagatgctctgcaaggcttctggc
tacacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctattatccaggaaat
ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
25 cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgtactatagtaactttactggtacttcgatgtctggggcac
agggaccacggtcaccgtctcttctgatcaggagcccaaatcttctgacaaaactcacacatgccaccgtcccagcacctgaac
tcttggggggaccgtcagcttctcttccccccaaaaccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtggaggagctgagccacgaagaccctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgccaagacaaag
ccgcgggaggagcagtagaacagcagctaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaagga
30 gtacaagtgaaggctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac
cacaggtgtacacctgccccatcccggaagagctgaccaagaaccaggtcagcctgacctgcctggtaaggcttctatcc

WO 2005/017148

PCT/US2003/041600

cagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgac
ggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
ggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

- 5 **2H7 scFv- MTH (SCS) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)**
MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPGKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGSGGGSGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
10 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTCPPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSL
15 SPGK

- 2H7 scFv- MTH (SSC) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)**
aagcttgcgccatggatttcaagtcagatttgcagttcctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagtcctcagcaatcctgtctgcactccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaagttacatgcact
20 ggtaccagcagaagccaggatcctcccccaccctggatttatcccatcaacctggcttctggagtcctgtcgttcagtg
gcagtggtgtcggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagttt
taaccacccacgttcggtgtcggaccaagctggagctgaagatggcgggtggctcggcggtggtggatctggaggaggtg
ggagctcagggcttatctacagcagctcgggctgagctggtgaggcctggggcctcagtgagatgtcctgcaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
25 ggtgatacttctacaatcagaagttcaaggcaaggccacactgactgtagacaaatcctccagcagcctacatgcagctcag
cagcctgacatctgaagactctcgggtctatttctgtgaagagtggtgtactatagtaacttactgtgacttcatgtctggggcac
agggaccacggtcaccgtctcttctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtgccagcactgaac
tcttggggggaccgtcagcttctcttcccccaaaaccaaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtgtggacgtgagccacgaagacctgaggtcaagttaactgtcagtggtggcgtggaggtgcataatgccaagacaaag
30 ccgcgggaggagcagtacaacagcagctaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
gtacaagtgcaaggtctccaacaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac

WO 2005/017148

PCT/US2003/041600

cacaggtgtacacctgccccatcccggtgatgagctgaccaagaaccaggtcagcctgacctgcctggtaaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagagaacaactacaagaccacgcctcccgctgctggactccgac
ggctccttctctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcata
ggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

5

2H7 scFv- MTH (SSC) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
10 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
15 NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

HIgGMHcys1 (nucleotide sequence) (SEQ ID NO: __)

ggt ggt gat cag gag ccc aaa tct tct gac aaa act cac aca tg

20

HIgGMHcys2 (nucleotide sequence) (SEQ ID NO: __)

ggt ggt gat cag gag ccc aaa tct tgt gac aaa act cac aca tct cca ccg tgc

HIgGMHcys3 (nucleotide sequence) (SEQ ID NO: __)

25 ggt ggt gat cag gag ccc aaa tct tgt gac aaa act cac aca tct cca ccg tcc cca gca cct

HuIgG1 MTCH3Y405 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgccccatcccgaggagatgaccaagaaccaggtcagcctgacctgcct
gggtcaaaggcttctatcccgagcagatcgccgtggagtgaggagagcaatgggcagccggagagaacaactacaagaccacgcctc

WO 2005/017148

PCT/US2003/041600

ccgtgctggactccgacggctcctctacctctatagcaagctcaccgtggacaagagcagggtggcagcaggggaacgtctctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3Y405 (amino acid sequence) (SEQ ID NO: __)

5 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPP
VLDSGDSFYLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgccccatcccgaggagatgaccaagaaccaggtcagcctgacctgcct
10 ggtcaaaggcttctatcccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttcgacctctatagcaagctcaccgtggacaagagcagggtggcagcaggggaacgtctctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3A405 (amino acid sequence) (SEQ ID NO: __)

15 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPP
VLDSGDSFALYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3A407 (nucleotide sequence) (SEQ ID NO: __)

Gggcagccccgagaaccacaggtgtacacctgccccatcccgaggagatgaccaagaaccaggtcagcctgacctgcc
20 tggtaaaggcttctatcccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcct
cccgtgctggactccgacggctccttctcctgccagcaagctcaccgtggacaagagcagggtggcagcaggggaacgtctctc
catgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3A407 (amino acid sequence) (SEQ ID NO: __)

25 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPP
VLDSGDSFFLASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3Y405A407 (nucleotide sequence) (SEQ ID NO: __)

WO 2005/017148

PCT/US2003/041600

gggcagccccgagaaccacaggtgtacacctgccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
ggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttctacctcgccagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

5

HuIgG1 MTCH3Y405A407 (amino acid sequence) (SEQ ID NO: __)

GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPP
VLDSGDSFYLASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

10 **HuIgG1 MTCH3A405A407 (nucleotide sequence) (SEQ ID NO: __)**

gggcagccccgagaaccacaggtgtacacctgccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
ggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttgcctcgccagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttct
catgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

15

HuIgG1 MTCH3A405A407 (amino acid sequence) (SEQ ID NO: __)

GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPP
VLDSGDSFALASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

20 **2H7 scFv MTH (SSS) WTCH2MTCH3Y405 (nucleotide sequence) (SEQ ID NO: __)**

aagcttgcgccaatggattttcaagtgacagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgacgggccagctcaagtgttaattacatgcact
ggtagcagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggattt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagctggtgaggcctggggcctcagtgaaatgtcctgcaaggcttctggc
tacacattaccagttacaatatgcactgggtaaagcagacacctagacaggcctggaatggattggagctatttatccaggaat
gggtatacttctacaatcagaagttcaagggcaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactgggtactctgatgtctggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtccccagcacctgaac

30

WO 2005/017148

PCT/US2003/041600

tcctgggggaccgtcagttctctctcccccaaaaccaaggacacctcatgatctccggaccttgaggtcacatgctg
gtgggtggacgtgagccacgaagacctgaggtcaagttcaactggtagtgacggcgtggaggtgcataatgccaagacaaag
ccgggggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
gtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaac
5 cacaggtgtacacctgccccatccgggaggagatgaccaagaaccagggtcagcctgacctgctgtaaaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgac
ggctccttctacctctatagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
ggctctgcacaaccactacacgcagaagagcctctcctgtccccgggtaaatgatctaga

10 **2H7 scFv MTH (SSS) WTCH2MTCH3Y405 (amino acid sequence) (SEQ ID NO: __)**
MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
15 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDFYLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
20 PGK

2H7 scFv MTH (SSS) WTCH2MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)
aagcttgccgcatgatttcaagtcagattttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
25 ggtaccagcagaagccaggatcctccccaaacctggatttatccccatccaacctggcttctggagtccctgctcgttcagtg
gcagtggtgtgggaccttactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggatt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcgggcgggtggatctggaggagggtg
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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SSS) WTCH2MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)

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20 2H7 scFv MTH (SSS) WTCH2MTCH3A407 (nucleotide sequence) (SEQ ID NO: __)

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WO 2005/017148

PCT/US2003/041600

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15 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
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2H7 scFv MTH (SSS) WTCH2MTCH3Y405A407 (nucleotide sequence) (SEQ ID NO: __)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SSS) WTCH2MTCH3Y405A407 (amino acid sequence) (SEQ ID NO: __)

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20 KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
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2H7 scFv MTH (SSS) WTCH2MTCH3A405A407 (nucleotide sequence) (SEQ ID NO: __)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SSS) WTCH2MTCH3A405A407 (amino acid sequence) (SEQ ID
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 20 TAYMQLSSLTSEDSAVYFCARVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
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 25 PGK

2H7 scFv MTH (SCC) WTCH2CH3 (nucleotide sequence)
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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SCC) WTCH2CH3 (amino acid sequence)

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20 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQFKGKATLTVDKSSS
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2H7 scFv MTH (CSC) WTCH2CH3 (nucleotide sequence)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (CSC) WTCH2CH3 (amino acid sequence)

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2H7 scFv MTH (CCS) WTCH2CH3 (nucleotide sequence)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (CCS) WTCH2CH3 (amino acid sequence)

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30 **HuIgAHIgA-T4-ORF (nucleotide sequence)**

WO 2005/017148

PCT/US2003/041600

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5 cgctaaccgccaccctctcaaaatccggaacacattccggcccgagggtccacctgctgccgccgctcgaggagctggccc
tgaacgagctgggtgacgtgacgtgcctggcacgtggcttcagccccaaggatgtgctggttcgctggctgcaggggtcacagg
agctgccccgcgagaagtacctgacttgggcatccggcaggagcccagccagggcaccaccaccttcgctgtgaccagcata
ctgcgctggcagccgaggactggaagaagggggacaccttctctgcatggtggccacgaggccctgccgtggccttcac
acagaagaccatcgaccgcttggcgggtaaacccacccatgtcaatgtgtctgtgtcatggcggaggtggacgcggatccttcga
10 ac

HuIgAHIgA-T4-ORF (amino acid sequence)

DQVPVSTPPTSPSTPPTSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGV
TFTWTPSSGKSAVQGPDRDLGCGYSVSSVLPGCAEPWNHKGTFCTAAYPESKT
15 PLIATLSKSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQ
ELPREKYL TWASRQEPSQGTTFFAVTSILRVA AEDWKKGDTFSCMVGHEALPLAF
TQKTIDRLAGKPTHVNVSVVMAEVDADPSN

1D8-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttatggatttcaagtgcagatttcagcttctgctaatacgtgcttcagtcataatgtccagaggagtcgacattgtgctcactc
agtctccaacaacatagctgcatctccaggggagaaggtcaccatcacctgccgtgccagctccagtgaagtacatgtactggt
accagcagaagtcaggcgccctcccctaaactctggatttatgacacatccaagctggcttctggagttccaaatcgcttcagtggca
gtgggtctgggacctctattctctcgaatcaacaccatggagactgaagatgctgccacttattactgtcagcagtgagtagtact
ccgctcacgttcgggtctgggaccaagctggagatcaaacgggggtggcgggtggctcgggcgggtgggtgggtggcggcg
25 gatctcaggtgcagctgaaggaggcaggacctggcctgggtgcaaccgacacagacctgtccctcacatgcactgtctctgggtt
ctcattaaccagcgatggtgtacactggattcgacagcctccaggaaagggtctggaatggatgggaataatatattatgatggagg
cacagattataattcgaattaaatccagactgagcatcagcaggacacctccaagagccaagtttcttaaaaaatcaacagctctg
caaatgatgacacagccatgtattactgtgccagaatccactttgattactggggccaaggagtcattggtcacagtctcctctgac
agccagttccctcaactccacctaccccatctccctcaactccacctaccccatctccctcatgctgccacccccgactgtcactgca
30 ccgaccggccctcgaggacctgctcttaggttcagaagcgatcctcacgtgcacactgaccggcctgagagatgcctcaggtgtc
accttcacctggacgccctcaagtgggaagagcgctgttcaaggaccacctgacctgtgtggctgctacagcggtgtcca

WO 2005/017148

PCT/US2003/041600

gtgtcctgccgggctgtgccgagccatggaacatgggaagaccttcactgcactgctgcctaccccagtgccaagaccccgct
aaccgccaccctctcaaaatccggaaacacattccggcccagggtccacctgctgccgccccgctcggaggagctggccctgaa
cgagctgggtgacgctgacgtgcctggcacgtggcttcagcccaaggatgigtgtgtcgtgctgaggggtcacaggagct
gccccgcgagaagtacctgacttgggcatcccggcaggagcccagccaggggcaccaccaccttcgctgtgaccagcatactgc
5 gctgtggcagccgaggactggaagaagggggacaccttctcctgcatgggtggccacgaggccctgccgtggccttcacacag
aagaccatcgaccgcttggcgggtaaacccacccatgcaatgtgtctgtgtcatggcgagggtgacgcggatccttcgaacaa
cctgtcccatcctgggccattaccttaatctcagtaaatggaattttgtgatgtgctgcctgacctactgctttccccaagatgcag
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AA

10 **1D8 scFv IgAH IgA-T4-CD80 (amino acid sequence)**

MDFQVQIFSFLISASVIMSRGVDIVLTQSPTTIAASPGKEVTITCRASSSVSYMYWY
QQKSGASPKLWIYDTSKLGSGVGNRFSGSGSGTSYSLAINTMETEDAATYYCQQW
SSTPLTFGSGTKLEIKRGGGSGGGGSGGGGSGVQLKEAGPGLVQPTQTLSTCTV
SGFSLTSDGVHWIRQPPGKGLEWMGIHYDGGTDYNSAIKSRLSISRDTSKSQVFLK
15 INSLQTTDDTAMYYCARIHFDYWGQGVMTVSSDQVPSTPPTPSPSTPPTPSPSCC
HPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVTFTWTPSSGKSAVQGPPDRDL
CGCYSVSSVLPGCAEPWNHGKTFTCTAAYPESKTPLTATLSKSGNTRPEVHLLPP
PSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKYLTWASRQEPSQGT
FAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDRLAGKPTHVNVSVVM
20 AEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

human IgE Fc (CH2-CH3-CH4) ORF (nucleotide sequence)

tgtacacgtctgtccagggaacttcaccccgcccaccgtgaagatcttacagtcgtcctgcgacggcgggcacttcccccg
accatccagctcctgtgcctcgtctctgggtacacccagggaactatcaacatcacctggctggaggacgggcagggtcatggacg
25 tggactgtccaccgctctaccacgcaggagggtgagctggcctccacaaaagcgagctcacctcagccagaagcactggc
tgtcagaccgcacctacacgtgccaggtcacctatcaaggtcacaccttgaggacagcaccagaaggtgtgcagattccaacc
gagaggggtgagcgctacctaagccggccagcccgttcgacctgttcacgcaagtcgccacgatcacctgtctggtggtg
gacctggcaccagcaaggggaccgtgaacctgacctgtgtccggggccagtggaagcctgtgaaccactccaccagaaagg
aggagaagcagcgcaatggcacgttaacctgcacgtccacctgccggtgggcacccgagactggatcaggggggagacct
30 ccagtgcagggtgaccacccccacctgccaggccctcatcggtccacgaccaagaccagcgcccgctgctgccccg
gaagtctatgcgttgcgacgccggagtgccggggagccgggacaagcgaccctgcctgctgatccagaactcatgcct

WO 2005/017148

PCT/US2003/041600

gaggacatctcggcagtgaggcgcacacgaggtgcagctcccgagcccgccacagcacgacgagccccgcaagacc
aagggctccggcttctcgtcttcagccgcctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcgagccccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaagcggatccttcgaa

AA

5 **human IgE Fc (CH2-CH3-CH4) ORF (amino acid sequence)**

DHVCSDFTPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDV
DLSTASTTQEGELASTQSELTLQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSN
PRGVSAAYLSRSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKE
EKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPE
10 VYAFATPEWPGSRDKRTLACLIQNFMPEISVQWLHNEVQLPDARHSTTQPRKTK
GSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGKADPS

1D8 scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttatggatttcaagtcagatlttcagcttctgtaatacagtgcttcagtcataatgtccagaggagtcgacatltgctcactc
15 agtctccaacaaccatagctgcatctccaggggagaaggcaccatcacctgccgtgccagctccagtgtaagttacatgtactggt
accagcagaagtcaggcgcctccccctaaactctgatttatgacacatccaagctggcttctggagttccaaatcgttcagtgga
gtgggtctgggacctcttattctctcgaatcaacacatggagactgaagatgctgccacttattactgacagcagtgaggtagtact
ccgtcacgttcgggtctgggaccaagctggagatcaaacggggtggcgggtggctcgggcgggtgggtgggtggcggcg
gatctcaggtgcagctgaaggaggcaggacctggcctggtgcaaccgacacagaccctgtccctcacatgactgtctctgggtt
20 ctattaaccagcagtggtgtactggttcgacgcctccaggaaagggtctggaatggatgggaataatattatgatggagg
cacagattataattcagcaattaaatccagactgagcatcagcaggacacctccaagagccaagtttcttaaaaatcaacagctg
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25 ttgtccaccgcctctaccacgcaggagggtgagctggcctccacaaaagcagctcacctcagccagaagcactggctgtca
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30 cagggtgacccacccccacctgcccagggccctcatcggtccacagaccaagaccagcgcccgctgctgccccggaagtct
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WO 2005/017148

PCT/US2003/041600

atctcgggtgcagtggctgcacaacgaggtgcagctcccgacgcccggcacagcacgacgagccccgcaagaccaagggct
ccggcttcttcgtcttcagccgcctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctatga
ggcagcgagccccctcacagaccgtccagcagcgggtgtctgtaaattcccgtaaagcggatccttcgaagctcccatcctgggc
cattaccttaatctcagtaaatggaattttgtgatatgctgcctgacctactgctttgcccccaagatgcagagagagaaggagggaatg
5 agagattgagaagggaaaagtgtacgccctgtataaatcgata

1D8-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)

MDFQVQIFSLLISASVIMSRGVDIVLTQSPTTIAASPGEKVTITCRASSSVSYMYWY
QQKSGASPKLWIYDTSKLGSGVGNRFSGSGSGTSYSLAINTMETEDAATYYCQQW
10 SSTPLTFGSGTKLEIKRGGGGSGGGGSGGGGSQVQLKEAGPGLVQPTQTLSLTCTV
SGFSLTSDGVHWIRQPPGKGLEWMGIYYDGGTDYNSAIKSRLSISRDTSKSQVFLK
INSLQTDDTAMYYCARIHFDYWGQGVMTVSSDHVCSRDFTPPTVKILQSSCDGG
GHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQEGELASTQSELTL
QKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSAYLSRPSPFDLFIRKSPTI
15 TCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTRDWI
EGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLI
QNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDE
FICRAVHEAASPSQTVQRAVSVNPGKADPSKLPWAITLISVNGIFVICCLTYCFAP
RCRERRRRNERLRRESVRPV

20

5B9-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttgccgccatgaggttctctgctcagcttctggggctgcttctgctctggatccctggatccactgcagataattgtgatgacgca
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cttatttgatttggtatctgcagaagccaggccagtcctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcaggaca
25 ggttcagtagcagtggtcaggaactgattcacactgagaatcagcagagtgaggagtgaggatgtgggtgtttattactgtgctc
aaaactagaactccgctcacgttcggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt
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30 aaaatgaacagtctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactgggggtcaaggaaacctcagtcaccgtctcctctgatcagccagttccctcaactccacctaccccatctccctcaactccacct

WO 2005/017148

PCT/US2003/041600

accccatctccctcatgctgccacccccgactgtcaactgcaccgaccggccctcgaggacctgctcttaggttcagaagcgatcct
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5 cacctgctgccgccgccgtcgaggagctggccctgaacgagctggtgacgctgacgtgcctggcagctggcttcagcccca
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gccagggcaccaccaccttcgctgtgaccagcactgcgcgtggcagccgaggactggaagaagggggacaccttctctgc
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ctgtgtcatggcggaggtggacgcggatccttcgaacaacctgctcccatcctggccattaccttaatctcagtaaatggaatttt
10 gtgatatgctgcctgacctactgctttgccccaaagtgcagagagagaaggaggaatgagagattgagaagggaagtgtacgcc
ctgtataaatcgatac

5B9-IgAH IgA-T4-CD80 (amino acid sequence)

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
15 LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLIFGAGTKLELKRGGGSGGGGSGGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSSGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSTVTVSSDQVPVST
PPTPSPSTPPTPSPSCCHPRLSLHRPALEDLLLSEAILTCTLTGLRDASGVTFWTTPS
20 SGKSAVQGPPDRDLGCGYSVSSVLPGCAEPWNHKGKTFCTAAYPESKTPLTATLS
KSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKY
LTWASRQEPSQGTTFFAVTSILRVAAEDWKKGDTFSCMVGHEALPLAFTQKTIDR
LAGKPTHVNVSVVMAEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRER
RRNERLLRESVRPV

25

5B9-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttgccgcatgaggttctctgctcagcttctggggctgctgtgctctggatccctggatccactgcagataattgtgatgacga
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cttatttgatttggtatctgcagaagccaggccagctcctcagctcctgatttatcagatgtccaacctgcctcaggagctccagaca
30 gggtcagtagcagtggtcaggaaactgattcacactgagaatcagcagagtgagggtgaggatgtgggtgtttattactgtgtc
aaaatctagaactccgctcacgttcggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt

WO 2005/017148

PCT/US2003/041600

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5 ctactgggtgaaggaacctcagtcaccgtctctctgatcacgtctgtccagggaacttaccctgcccaccgtgaagatcttaca
gtctctctgcgacggcgggcggtcacttccccccaccatccagctctgtgcctcgtctctgggtacacccagggaactatcaac
atcacctggctggaggacgggcaggtcatggacgtggacttgcaccgcctctaccacgcaggaggtgagctggcctccaca
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aggacagcaccaagaagtgtgcagattccaacccgagaggggtgagcgctacctaagccggcccagccgttcgacctgttca
10 tccgcaagtcgcccacgatcacctgtctgggtgggacctggcaccagcaaggggaccgtgaacctgacctggctcccgggcca
gtgggaagcctgtgaaccactccaccagaaggaggagaagcagcgcaatggcacgttaacctgacctccacctgcccgtg
ggcacccgagactggatcgagggggagacctaccagtgcaggggtgacccaccccccacctgcccaggggcctcatcggtcca
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gcacctcgcctgcctgatccagaacttcatgcctgaggacatctcgggtgcagtggctgcacaacgaggtgcagctcccggacgc
15 ccggcacagcacgacgcagccccgaagaccaagggtccggcttctcgtcttcagccgcctggaggtgaccaggggccgaat
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actgcttgcaccaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgcctgtataaatcgata

20 **5B9-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)**

MRFSAQLLGLLVLPWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLLSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSK
25 SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSVTVSSDHVCSR
DFTPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTAS
TTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSA
YLSRPSFDLFIKSPITITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNG
TLTVTSTLPVGTDRDIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATP
30 EWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFS
RLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVPNGKADPSKLPSWAITLISV
NGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

WO 2005/017148

PCT/US2003/041600

2e12-scFv-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttatggattttcaagtgcagattttcagcttcctgctaatacagtgcttcagtcataatgtccagaggagtcgacattgtgctcacc
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5 taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcatccaacgtagaatctggggctccctgcc
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10 atgggggtgatggaagcacagactataattcagctctcaaatccagactgagcatcaccaaggacaactccaagagccaagtttctt
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acgtgcacactgaccggcctgagagatgcctcaggtgtcaccttcacctggacggcctcaagtgggaagagcgctgttcaaggac
15 cacctgacagtgacctctgtggctgctacagcgtgtccagtgctcctgccgggctgtgccgagccatggaacctgggaagaccttc
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ccagggcaccaccaccttcgctgtgaccagcatactgcgctggcagccgaggactggaagaagggggacaccttctcctgcat
20 ggtgggccacgaggccctgccgctggccttcacacagaagaccatcgaccgcttggcgggtaaacccacccatgtcaatgtgtct
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gtataaatcgatac

25 2e12-scFv-IgAH IgA-T4-CD80 (amino acid sequence)

MDFQVQIFSLLISASVMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMFY
CQQSRKVPWTFGGGTKLEIKRGGGSGGGGSGGGGSQVQLKESGPGLVAPSQSL
ITCTVSGFSLTGYGVNWVRQPPGKLEWLGMWGDGSTDYNSALKSRLSITKDNS
30 KSQVFLKMNSLQTDRTARYYCARGYSNFHYVMDYWGQGTSTVTVSSDQPVPS
TPPTPSPSTPPTPSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVTFWTWP
SSGKSAVQGPPDRDLGCYSVSSVLPGCAEPWNHKGKTFTCTAAYPESKTPLTATLS

WO 2005/017148

PCT/US2003/041600

KSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKY
LTWASRQEPSQGTTFFAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDR
LAGKPTHVNVSVVMAEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRER
RRNERLRRESVRPV

5

2e12-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttatggatttcaagtcagatttcagcttcctgctaatacagtcctcagtcataatgtccagaggagtcgacattgtgtcaccc
aatctccagcttcttggctgtgtctctaggtcagagagccaccatctctgcagagccagtgaagtggtgaatattatgcacaagtt
taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcaccaacgtagaatctggggtccctgcc
10 aggttttagtggcagtgggctctgggacagacttcagcctcaacatccatctgtggaggaggatgatattgcaatgtatttctgtcagc
aaagtaggaaggttccttggacgttcgggtggaggcaccagctggaaatcaaacggggtggcgggtggctcgggcggaggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctgggtggcgccctcacagagcctgtccatcacatgc
accgtctcagggttctcattaaccggctatggtglaaactgggttcgccagcctccaggaaagggtctggagtggctgggaatgat
atggggtgatggaagcacagactataattcagctctcaaattccagactgagcaicaccaaggacaactccaagagccaagtlttct
15 aaaaatgaacagctgcaaactgatgacacagccagatactactgtgccagagatggttatagtaacttccattatgttatggact
actggggtaaggaacctcagtcaccgtctctcagatcacgtctgtccagggttcaccccgccaccgtgaagatcttacag
tcgtctcgcagcggcgggcacttcccccgaccatccagctcctgtgcctcgtctctgggtacaccccagggaactatcaacat
cacctggctggaggacgggcaggtcatggacgtggacttgtccaccgcctctaccacgcaggagggtgagctggcctccacac
aaagcgagctcaccctcagccagaagcactggctgtcagaccgcacctacacctgccaggtcacctatcaaggtcacaccttga
20 ggacagcaccaagaagtgtgcagattccaacccgagaggggtgagcgcctacctaaagccggcccagcccgttcgacctgttcat
ccgcaagtcgccacgatcacctgtctggtgggtggacctggcaccagcaaggggacctggaacctgacctgtccgggcca
gtgggaagcctgtgaaccactccaccagaaaggaggagaagcagcgcaatggcacgttaacctgcacgtccacctgccggtg
ggcaccggagactggatcgagggggagacctaccagtgcagggtgacccacccccacctgccaggggccctcatcggtcca
cgaccaagaccagcggcccgctgtgtccccggagctatgcgttgcgacgccggagtggccggggagccgggacaagc
25 gcacctcgcctgcctgatccagaactcatgcctgaggacatctcgggtgcagtggtgcacaacgaggtgcagctcccggaagc
ccggcacagcacgacgcagccccgaagaccaagggtccggcttctgtcttcagccgcctggaggtgaccagggccgaat
gggagcagaaagatgagttcatctgccgtgcagtcctatgaggcagcgagccctcacagacctccagcgagcggtgtctgtaa
atcccggtaaagcggatccttgaagctcccacctgggccattacctaatctcagtaaatggaattttgtgatgtgcctgacct
actgctttgccccaaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgccctgtataaatcgata

30

2e12-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)

WO 2005/017148

PCT/US2003/041600

MDFQVQIFSFLISASVIMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKLEIKRGGGSGGGGSGGGGSQVQLKESGPGLVAPSQSLS
ITCTVSGFSLTGYGVNWVRQPPGKLEWLGMWGDGSTDYNSALKSRLSITKDNS
5 KSQVFLKMNSLQDDTARYYCARDGYSNFHYVMDYWGQGTSTVTVSSDHVCSR
DFTPPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTAS
TTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSA
YLSRPSFDFLIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNG
TLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATP
10 EWPGRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKSGGFFVFS
RLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGKADPSKLPSWAITLISV
NGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

500A2 scFv (nucleotide sequence)

15 atgttgtatcacatctcagctccttgggcttttactcttctggattcagcctccagaagtgacatagtgctgactcagactccagccactc
tgtctctaattcctggagaaagagtcacaatgacctgtaagaccagtcagaatattggcacaatctacactggatcacccaaaacc
aaaggaggtccaagggtctcatcaagtatgcttcgcagtcattcctggatccctccagattcagtggcagtggtcggaaac
agatttcactctcagcatcaataacctggagcctgatgatcggaaatttactgtcaaaaagtagaagctggcctgtcacgttcg
gtcctggcaccagaagctggagataaaacggggtggcggtggctcggcgagggtgggtggcgggatctcaggtcaa
20 gctgcagcagtcgggttctgaactagggaaacctggggcctcagtgaaactgtcctgcaagacttcaggctacatattcacagatc
actatatcttgggtgaaacagaagcctggagaaagcctgcagtggaataggaaatgttatggggaatgggtgacaagctaca
atcaaaaattccagggaaggccacactgactgtagataaaatcttagcacagcctacatggaactcagcagcctgacatctgag
gattctgccatctattactgtgcaagaaggccggtagcgacgggccatgctatggactactggggtcaggggatccaagttaccgt
ctcctctgac

25

500A2 scFv (amino acid sequence)

MLYTSQLLGLLLFWISASRSDIVLTQTPATLSLIPGERVTMTCKTSQNIGTILHWYH
QKPKEAPRALIKYASQSIPGIPSRFSGSGSETDFTLSINNLEPDDIGIYYCQQSRSWPV
TFGPGTKLEIKRGGGSGGGGSGGGGSQVKLQQSGSELGKPGASVKLSCKTSGYIF
30 TDHYISWVKQKPGESLQWIGNVYGGNGGTSYNQKFQGKATLTVDKISSTAYMEL
SSLTSEDSAIYYCARRPVATGHAMDYWGQGIQVTVSSD

WO 2005/017148

PCT/US2003/041600

NT

5' oligo:

Name : IgGWT3

GTTGTTTTCTGAAGGATCCGCTTTACCCGGAGACAGGGAGAGGCTCTT

5 NT

3' oligo:

Name : hIgGWT5

GTTGTTAGATCTGGAGCCCAAATCTTGTGACAAAACCTCACACATG

NT

10 5' oligo:

Name : FADD5

Sequence

GTTGTGGATCCTTCGAACCCGTTCTTGGTGCTGCTGCACTCGGTGTCG

NT

15 3' oligo:

Name : FADD3

Sequence

GTTGTTATCGATCTCGAGTTATCAGGACGCTTCGGAGGTAGATGCGTC

NT

20 **FADD-CSSCFV (nucleotide sequence)**

gtggatccttcgaacccgttcctggtgctgctgcacitcgggtgctgctccagcctgtcgagcagcgagctgaccgagctcaagttccta
tgccctcggggcgctgggcaagcgcaagctggagcgctgcagagcggcctagacctcttccatgctgctggagcagaacga
cctggagcccgggcacaccgagctcctgcgcgagctgctgcctccctcgggcgccacgacctgctgcggcgctcgacgact
tcgagggcggggcgggcgccggggccgcctggggaagaagacctgtgtgcagcatttaacgtcatatgtgataatgtgggg
25 aaagattggagaaggctggctcgtcagctcaaagtctcagacaccaagatcgacagcatcgaggacagataaccccgcaacctg
acagagcgtgtgcgggagtcactgagaatctggaagaacacagagaaggagaacgcaacagtggcccacctgggtgggggctc
tcaggtcctgccagatgaacctgggtggctgacctggtacaagagggtcagcaggcccgtagacctccagaacaggagtggggcca
tgtccccgatgtcatggaactcagacgcactctacctccgaagcgctcctgataactcgagatcgataaacaac

30 **FADD-CSSCFV (amino acid sequence)**

PCT/US2003/041600

5

GTTGTGGATCCTCCCTTTTGGGTGCTGGTGGTGGTTGGTGTCTTGGCTTGCTAT
AGCTTG

GTTGTTTCGAACCCAGAAAATAATAAAGGCCACTGTTACTAGCAAGCTATAGC
AAGCCAG

15 GTTGTGGATCCTCCCTTTTGGGGTGCTGGTGGT

GTTGTTTCGAACCCAGAAAAATAATAAAGGCCAC

GTTGTGGATCCTCCTGCTCCCATCCTGG

25 GTTGTTTCGAACGGCAAAGCAGTAGGTCAGGC

GTTGTGGATCCTTCGAACCCATTCCTGGTGCTGCTGCACTCGCTG

WO 2005/017148

PCT/US2003/041600

MFADD3XC (nucleotide sequence)

GTTGTTATCGATCTCGAGTCAGGGTGTCTTCTGAGGAAGACAC

- 5 **Murine FADD nucleotide sequence** (full length, but without flanking -Ig or transmembrane sequences) (nucleotide sequence)

gtggatccttgaacatggaccattcctggtgctgctgcactcgtgtccggcagcctgtcgggcaacgatctgatggagctcaa
gtttctgtccgcgagcgcgtgagcaaacgaaagctggagcgcgtgcagagtggcctggacctgttcacgggtgctgctggagca
gaacacctggagcgcgggcacaccgggctgctgcgcgagttgctggcctcgtgcgccgacacgatctactgcagcgcctgg
10 acgacttcgaggcggggacggcgaccgctgcgccccgggggaggcagatctgcaggtggcatttgacattgtgtgtgacaatg
tggggagagactggaaaagactggccccgcgagctgaaggtgtctgaggccaagatggatgggattgaggagaagtacccccg
aagtctgagtgaaggtaaggagagctctgaaagtctggaagaatgctgagaagaagaacgcctcgggtggccggactggtca
aggcgctgcggacctgcaggctgaatctggtggctgacctggtggaagaagcccaggaatctgtgagcaagagtgagaatatgt
ccccagtactaagggttaactgtgttctcctcagaaacacctgactcgagatcgat

15

Murine FADD (amino acid sequence)

VDPSNMDPFLVLLHSLSGSLSGNDLMELKFLCRERVSKRKLERVQSGLDLFTVLLE
QNDLERGHTGLLRELLASLRRHDLQRLDDFEAGTATAAPPGEADLQVAFDIVCD
NVGRDWKRLARELKVSEAKMDGIEEKYPRSLSERVRESLKVWKNAEKKNASVA
20 GLVKALRTCRLNLVADLVEEAQESVSKSENMSPVLRDSTVSSSETP

MCASP3-5 (nucleotide sequence)

GTTGTGGATCCTTCGAACATGGAGAACAACAAAACCTCAGTGGATTCA

- 25 **MCASP3-3 (nucleotide sequence)**

GTTGTTATCGATCTCGAGCTAGTGATAAAAGTACAGTTCTTTTCGT

MCASP8-5 (nucleotide sequence)

GTTGTTTCGAACATGGATTTCAGAGTTGTCTTTATGCTATTGCTG

WO 2005/017148

PCT/US2003/041600

MCASP8-3 (nucleotide sequence)

GTTGTTATCGATCTCGAGTCATTAGGGAGGGAAGAAGAGCTTCTTCCG

5 **hcasp3-5(nucleotide sequence)**

GTTGTGGATCCTTCGAACATGGAGAACACTGAAAACTCAGTGGAT

hcasp3-3 (nucleotide sequence)

GTTGTTATCGATCTCGAGTTAGTGATAAAAATAGAGTTCTTTTGTGAG

10

hcasp8-5 (nucleotide sequence)

GTTGTGGATCCTTCGAACATGGACTTCAGCAGAAATCTTTATGAT

hcasp8-3 (nucleotide sequence)

15 GTTGTTATCGATGCATGCTCAATCAGAAGGGAAGACAAGTTTTTTTCT

1. 2H7 scFv with alternative VHL11 mutations:

Nucleotide sequence

20 Aagcttgccgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
tcccagctcagcaatcctgtctgcatctccaggggagaaggtcacaatgactgcagggccagctcaagtgaagttacatgcac
tggtaccagcagaagccaggatcctcccccacccctggatttatgcccacccaacctggcttctggagtcctgctcgttcagt
ggcagtggtctgggaccttactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
ttaaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtgctgggcgggtggtggtatctggaggaggt
gggagctctcaggcttatctacagcagctctggggtgag (one of the following: tcn, acn, gan, can, aan,
25 **egn, agn**)
gtgaggcctggggcctcagtgagatgtcctgcaaggcttctggctacacattaccagttacaatatgcactgggtaaagcagaca
cctagacagggcctggaatggattggagctatttatccaggaaatggtgatacttctacaatcagaagttcaagggaaggccac
actgactgtagacaaaatcctccagcacagcctacatgcagctcagcagcctgacatctgaagactctgcggtctatttctgtgcaag
agtggtgtactatagtaactcttactggtacttcgatgtctggggcacagggaccacggtcaccgtctcttctgatcag

30

Amino acid sequence

25 MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPGKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAE (one of the following:
35 **S, T, D, E, Q, N, R, K, H**)
VRPGASVKMSCKASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFK

WO 2005/017148

PCT/US2003/041600

GKATLTVDKSSSTAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVT
VSSDQ

2. VHL11 deletion

5 Nucleotide sequence:
Aagcttgccgcatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
tccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaagttacatgcac
tggaccagcagaagccaggatcctccccaaacctggatttatgcccataccaacctggcttctggagtcctctgctcgttcagt
ggcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
10 ttaaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtggatctggaggaggt
gggagctctcaggcttatctacagcagctctggggctgaggtgagggcctcagtgaaagatgctcgaaggtctctggct
acacattaccagttacaatatgactgggtaagcagacacctagacagggcctggaatgattggagctattatccaggaaatg
gtgatacttctacaatcagaagttcaagggcaagggcacactgactgtagacaaatcctccagcagacgtacatgcagctcagc
agcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactggacttcgatgtctggggcaca
15 gggaccacggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
20 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAEVRPGASVKMSCKA
SGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSST
AYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQ

3. 2H7 VL L106 with alternative mutations

25 Nucleotide sequence:
aagctlgccgcatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaagttacatgcact
ggaccagcagaagccaggatcctccccaaacctggatttatgcccataccaacctggcttctggagtcctctgctcgttcagt
gcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggatt
30 taaccacccacgttcggtgctgggaccaagctggag (tcn, agn, aan, cgn, can, gan, and non-natural
derivatives of these codons) aaagatggcgggtggctcggcggtggtggatctggaggaggtgggagctc

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
35 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLE (S, T, R, K, H, Q, N, D, E, and non-natural derivatives of these
amino acids at position 106)KDGGGSGGGGSGGGGSS

4. VL L106 deletion

40 Nucleotide sequence:
Aagcttgccgcatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
tccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaagttacatgcac
tggaccagcagaagccaggatcctccccaaacctggatttatgcccataccaacctggcttctggagtcctctgctcgttcagt
ggcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
45 ttaaccacccacgttcggtgctgggaccaagctggagaaagatggcgggtggctcggcggtggtggatctggaggaggtgg
gagctc

Amino acid sequence:

WO 2005/017148

PCT/US2003/041600

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSPGKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLEKDGGGSGGGGSGGGGSS

5 **5. IgE CH3 CH4**

Nucleotide sequence:

tccaacccgagaggggtgagcgccctacctaagccggccagcccgttcacctgttcacccgaagtcgcccacgatcacctgtc
tggtggtggacctggcaccagcaaggggaccgtgaacctgacctggtccggccagtggaagcctgtgaacctccacc
agaaaggaggagaagcagcgcgaatggcacgttaacctgacgtccacctgcccgtgggacccgagactggatcgaggggg
10 agacctaccagtgcagggtgacccacccccacctgcccagggccctcatgcgtccacgaccaagaccagcggcccgctgct
gccccggaagtctatgcgttgcgacggcggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactt
catgctgaggacatctcgtgcagtggctgcacaacgaggtgcagtcctccggacgcccggcacagcagcagcagccccgc
aagaccaagggtccggcttctgcttccagccgctggaggtgaccagggccgaatgggagcagaagatgagttcatctgcc
gtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaatgataatctagaa

15

Amino acid sequence:

SNPRGVSAYLSRPSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTR
KEEKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAA
PEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRK
20 TKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

6. hIgG1H/IgE WCH3 WCH4

Nucleotide sequence:

tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtccccagcatccaacccgagaggggtgagcgccctaccta
25 agccggcccagcccgttcacctgttcacccgaagtcgcccacgatcacctgtctggtggtggacctggcaccagcaagggg
acctgaacctgacctggtcccgggcccagtggaagcctgtgaacctccaccagaaaggaggagaagcagcgcgaatggca
cgtaaacgtcacgtccacctgcccgtgggcccagactggatcgagggggagacctaccagtgcagggtgacccacccc
cacctgcccagggccctcatgcgtccacgaccaagaccagcggcccgctgctgccccggaagtctatgcgttgcgacgcc
ggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactcatgctgaggacatctcgtgcagtggct
30 gcacaacgaggtgcagtcctccggacgcccggcacagcagcagcagcagcccgcaagaccaagggtccggcttctcgtctca
gcccgtggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctatgaggcagcgagccctca
cagaccgtccagcgagcgggtgtctgtaaatcccggtaatgataatctagaa

Amino acid sequence:

DQEPKSSDKTHTSPPSPASNPRGVSAYLSRPSPFDLFIRKSPTITCLVVDLAPSKGTV
35 NLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHL
PRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLH
NEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQT
VQRAVSVNPGK

40

7. IgE WCH2 WCH3 WCH4

Nucleotide sequence:

Tgatcagctctgtccaggacttcacccgcccaccgtgaagatcttacagtcgtcctgcgacggcggcgggacacttcccccg
accatccagctcctgtgctcgtcttggtacacccagggactcaacatcacctggctggaggacgggcaggtcatggacg
45 tggactgtccaccgctctaccacgcaggaggggtgagctggcctccacaaagcgagctcacctcagccagaagcactggc
tgtcagaccgcacctacacctgccaggtcacctatcaaggtcacaccttgaggacagcaccagaaggtgtgcagattccaacc
gagaggggtgagcgccctacctaagccggcccagcccgttcacctgttcacccgaagtcgcccacgatcacctgtctggtggtg
gacctggcaccagcaaggggaccgtgaacctgacctggtcccgggcccagtggaagcctgtgaacctccaccagaaagg
aggagaagcagcgcgaatggcacgttaacctgcagtcacacctgcccgtgggcccagactggatcgagggggagacctta
ccagtgcagggtgaccacccccacctgcccagggccctcatgcgtccacgaccaagaccagcggcccgctgctgccccg
50 gaagtctatgcgttgcgacggcggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactcatgct

WO 2005/017148

PCT/US2003/041600

gaggacatctcgggtgcagtggctgcacaacgaggtgcagctcccgagcggcgacagcagcagcagcccgcaagacc
aagggtccggcttctcgtctcagccgcctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaatgataatctaga

5 Amino acid sequence:
DHVCSRDFTPPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDV
DLSTASTTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSN
PRGVSAAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKE
EKQRNGTLTVTSTLPVGTDRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPE
10 VYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTK
GSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

8. hIgG1H/IgE CH3 CH4 (ORF)

Nucleotide sequence:

15 tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtccccagcatccaacccgagaggggtgagcgcclaccta
agccggccagcccggttcgacctgttcacccgaagtcgcccacgacacctgtctgggtggacctggcaccagcaagggg
accgtgaacctgacctggctccggggcagtggaagcctgtgaaccactccaccagaaaggaggagaagcagcgcaatggca
cgtaaccgtcacgtccacctgcccgtgggacccgagactggatcgagggggagacctaccagtgcagggtgacctacccc
cacctgcccaggggccctcatgctccacgaccaagaccagcggcccgctgtctgccccggaagtctatgctgttcgacgcc
20 ggagtgccggggagccgggacaagcgcacctcgcctgcctgatccagaacttcacctgaggacatctcgtgcagtggct
gcacaacgaggtgcagctcccgagcggcgacggcgacagcagcagcagcagcccgcaagaccaagggctccgcttctcgtctca
gccgctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctgaggcagcagccctca
cagaccgtccagcgagcgggtgtctgtaaatcccggtaaagcgatccttcgaa

25 Amino acid sequence:
DQEPKSSDKTHTSPSPASNPRGVSAAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTV
NLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTDRDWIEGETYQCRVTHPHL
PRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLH
NEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQT
30 VQRAVSVNPGKSGSFE

9. 2H7 VHL11S scFv hIgG1(SSS-S)H hIgE WCH3 WCH4

Nucleotide sequence:

35 aagcttcccgcattgatttcaagtgcagatttcagcttctcctgctaatcagtgcttcagtcataattgccagaggacaaattgtctct
cccagctccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaagtacatgcact
ggtaccagcagaagccaggatctccccaaacctggatttatccccatccaacctggcttctggagtcctcgtcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacgttcgggtgctgggaccaagctggagctgaagatggcgggtgctcggcggtgtggatctggaggaggtg
ggagctctcaggcttatctacagcagctctggggctgagtcggtgaggcctggggcctcagtggaagatgctcgaaggcttctggc
40 tacacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctatttatccaggaat
ggtgatacttctacaatcagaagttaaggcgcaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggctctattctgtgcaagagtgggtgactatagtaacttactggctactcagatgctggggcac
agggaccacggtcaccgtctctctgatcaggagcccaatctctgacaaaactcacacatccccaccgtcctcagcatccaacc
cgagaggggtgagcgcctacctaagccggccagccggttcgacctgttcacccgaagtcgccacagatcacctgtctgggtgt
45 ggacctggcaccagcaaggggaccgtgaacctgacctggctccggggcagtggaagcctgtgaaccactccaccagaag
gaggagaagcagcgcaatggcacgttaaccgtcacgtccacctgccgggtgggcacccgagactggatcagggggagacct
accagtgcagggtgaccaccccccacctgccaggggccctcatgctggtccacgaccaagaccagcggcccgctgctgcccc
ggaagtctatgctgttcgacgccggagtgccggggagccgggacaagcgcacctcgcctgctgatccagaacttcacgtcc
tgaggacatctcgggtgcagtggctgcacaacgaggtgcagctcccgagcggcgacagcagcagcagcccgcaagacc
50 aagggtccggcttctcgtctcagccgcctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaatgataatctaga

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 5 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
 THTSPSSASNPRGVSAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASG
 KPVNHSTRKEEKQRNGTLTVTSTLPVGTTRDWIEGETYQCRVTHPHLPRALMRSTT
 10 KTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDAR
 HSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNP
 GK

10. 2H7 VHL11S scFv hIgG1(SSS-P)H hIgE WCH3 WCH4

15

Nucleotide sequence:

aagcttgcgccatggaatttcaagtcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
 cccagctctccagcaatcctgtctgcattccaggaggagaaggtcacaatgacttgcaggggccagctcaagtgttaattacatgcact
 ggtaccagcagaagccaggatcctcccccacccctggatttatcccccacccaactggcttctggagtcctgtcgtctcagtg
 20 gcagtgggtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccatttactgccagcagtgagggtt
 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtggatctggaggaggtg
 ggagctctcaggcttactacagcagctggtgggtgagtcggtgaggcctggggcctcagtgaaatgtctgcaaggcttctggc
 tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttaccaggaaat
 ggtgatacttctcacaatcagaagttcaaggcgaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
 25 cagcctgacatctgaagactctgcggtctatttctgtcaagagtggtgactatagtaacttactgggtactctgatgtctggggcac
 agggaccacggtcaccgtctcttctgatcaggagcccacatcttctgacaaaactcacacatccccaccgtccccagcatccaacc
 cgagagggggtgagcgctacctaagccggccagccggttcgacctgttcacccgaagtcgccacgatcacctgtctggtggg
 ggacctggcaccagcaaggggaccgtgaacctgacctggtccgggacagtggaagcctgtgaaccactccaccagaaag
 gaggagaagcagcgcaatggcacgttaaccgtcacgtccacctgcccgtgggcacccgagactggatcgagggggagacct
 30 accagtgcagggtgacccacccacacctgcccaggggcctcatgctgggtccacgaccaagaccagcggcccgctgctgcccc
 ggaagtctatgcgttgcgacgccggagtgccggggagccgggacaagcgcaccctcgctgctgatccagaacttcatgcc
 tgaggacatctcgggtgagtggtgcacaacgaggtgcagctccggacggcgccgacagcacgacgcagccccgaagacc
 aagggtcccgcttctctctcagccgctggaggtgaccaggggcgaatgggagcagaagatgagttcatctgccgtgcag
 tccatgaggcagcagccccctcacagaccgtccagcgagcgggtgtctgtaaatcccggttaaatgataatctaga

35

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 40 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
 THTSPSPASNPRGVSAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASG
 KPVNHSTRKEEKQRNGTLTVTSTLPVGTTRDWIEGETYQCRVTHPHLPRALMRSTT
 KTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDAR
 45 HSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNP
 GK

10. 2H7 VL L106S

aagcttgcgccatggaatttcaagtcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
 50 cccagctctccagcaatcctgtctgcattccaggaggagaaggtcacaatgacttgcaggggccagctcaagtgttaattacatgcact
 ggtaccagcagaagccaggatcctcccccacccctggatttatcccccacccaactggcttctggagtcctgtcgtctcagtg

WO 2005/017148

PCT/US2003/041600

gcagtgggtctgggacctcttactcttcacaatcagcagagtggaggtgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacggtcgggtctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtgatctggaggaggtg
ggagctc

5 Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSS

10 11. 2H7 VL L106S scFv

Nucleotide sequence:

aagcttgcgccatggatttcaagtgcagatttcagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctc
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
gggtaccagcagaagccaggatcctccccaaccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
15 gcagtgggtctgggaccttactcttcacaatcagcagagtggaggtgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacggtcgggtctgggaccaagctggagcttaagatggcgggtggctcggcggtggtgatctggaggaggtg
ggagctctcaggcttatctacagcagctctggggctgagctggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
gggtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
20 cagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgtctggggc
agggaccacgggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
25 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQ

30 12. 2H7 scFv VL L106S VHL11S scFv

Nucleotide sequence:

Aagcttgcgccatggatttcaagtgcagatttcagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctc
tcccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcac
tggtaccagcagaagccaggatcctccccaaccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
35 ggcagtggtctgggaccttactcttcacaatcagcagagtggaggtgaagatgctgccacttattactgccagcagtgaggt
ttaaccacccacggtcgggtctgggaccaagctggagcttaagatggcgggtggctcggcggtggtgatctggaggaggt
gggagctctcaggcttatctacagcagctctggggctgagctcggtgaggcctggggcctcagtgaaatgctcgaaggcttctg
gctacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaa
atgggtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctc
40 agcagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgtctggggc
acagggaccacgggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
45 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQ

50 10. Human IgD hinge linker with attached restriction sites

Nucleotide:

WO 2005/017148

PCT/US2003/041600

gtggatccaggttcgaagtctccaaaggcacaggcctcctccgtgccactgcacaacccccagcagagggcagcctcgccaa
ggcaaccacagccccagccaccaccgtaacacaggaagaggaggagaagagaagaagaaggagaaggagaagaggaa
caagaagagagagacaaagaccggcgagtcgacg

- 5 Amino acid:
VDPGSKSPKAQASSVPTAQPQAEGSLAKATTAPATTRNTGRGGEEKKKKEKEKEEQ
EERETKTGAVD

Sequence of Native IgD hinge domain:

- 10 (includes a cysteine residue—we truncated the hinge prior to that residue for these
constructs:)

Nucleotide:

- gagtcctcaaaggcacaggcctcctccgtgccactgcacaacccccagcagagggcagcctcgccaaggcaaccacagccc
cagccaccaccgtaacacaggaagaggaggagaagagaagaagaaggagaaggagaagaggacaagaagagagaga
15 gacaaagacaccagagtgtccgagccacaccgcctcttgccgctctacctgctaaccct

Amino acid sequence:

- ESPKAQASSVPTAQPQAEGSLAKATTAPATTRNTGRGGEEKKKKEKEKEEQEERET
KTPECPSHTQPLGVYLLTP
20

12. 2H7 VH L11S

Nucleotide sequence:

- caggcttatctacagcagtcctggggctgagtcggtagggcctggggcctcagtgaaatgtcctgcaaggctctggtacacattt
accagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaaatggatgact
25 tctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcagcagcctga
catctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactctactggctcctgatgtctggggcacaggagacc
acggtcaccgtctctct

Amino acid sequence:

- 30 QAYLQQSGAESVRPGASVKMSCKASGYTFTSYNMHWVKQTPRQGLEWIGATYPG
NGDTSYNQKFKGKATLTVDKSSSTAYMQLSSLTSEDSAVYFCARVVYYNSYWY
FDVWGTGTTVTVSS

13. 2H7 VH L11S scFv

- 35 Nucleotide sequence:

- aagcttccgccatggatttcaagtcagatttcagcttcctgctaatacagtcgttcagtcataattgccagaggacaaattgtctct
cccagctcagcaatcctgtctgcactcaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
ggtaccagcagaagccaggtacctccccaaacctggatttatccccatccaacctggctctggagtcctgctcgttcagtg
gcagtggtgtctgggacctcttactctcacaatcagcagagtgagggtgaagatgtgccacttattactgccagcagtgagatt
40 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggctggctcggcggtggtggtatcgaggagggtg
ggagctctcaggcttatctacagcagtcctggggctgagtcggtgaggcctggggcctcagtgaaatgtcctgcaaggctctggtc
tacacattaccagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaaat
gggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactctactgggtactcagatgtctggggcac
45 agggaccacggtcaccgtctctctgatcag

Amino acid sequence:

- MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPSPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
50 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK

WO 2005/017148

PCT/US2003/041600

ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYSNSYWFYFDVWGTGTTVTVSSDO

14. 2H7 scFv VH L11S hIgG1 (CSC-S)H WCH2 WCH3

5 Nucleotide sequence:

aagcttgcgcgaatggaattcaagtgagatcttcagcttctgctaatacagtgcttcagtcataattgccagaggacaattgtctct
 cccagctccagcaatcctgctgcatctccaggaggagaaggtcacatgacttgaggggccagctcaagtgtgaagttacatgact
 ggtaccagcagaagccaggatcctccccaaccctggattatgcccatccaacctggctctggagtcctgctcgttcagtg
 gcagtgggtctgggacctcttactctcacaatcagcagagtgagggtgaagatgctgccacttactgccagcagtgagggtt
 10 taacccaccacgttcggtgctgggaccaagctggagctgaaagatggcggtggctcggcggtggtggatctggaggaggtg
 ggagctctcaggcttatctacagcagctcggggctgagctctgtgaggcctggggcctcagtgaaagatgctcgaaggctctggct
 acacatttaccagttacaatatgcaactgggtaagcagacacctagacagggcctggaatggatggagctattatccaggaaatg
 gtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaatctccagcacagcctacatgcagctcagc
 agcctgacatctgaagactctcggtctattctgtgcaagagtgggtgactatagtaactcttactgactlctgaigtctggggcaca
 15 gggaccacggtcaccgtctctctgacagagcccaatctgtgacaaaactcacacatccaccgtgclcagcacctgaactc
 ctgggtggaccgtcagcttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtggt
 ggtggacgtgagccacgaagacctgaggtcaagttcaactggctgacggcggtggaggtgcataatgccagacaaagc
 cgcggggaggagcagtcacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatgcaaggag
 tacaagtgaaggctccaacaagccctccagcccccacgagaaaacaatctccaaggccaaagggcagccccgagaacc
 20 acagggtgtacacctgccccatccgggatgagctgaccaagaaccagggtcagcctgacctgcttggtcgaaggctctatcca
 agcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacagaccacgcctcccgctgctggactccgacg
 gctccttctctctacagcaagctaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgatgcatgag
 gctctgcacaaccactacacgcagaagagcctctcctctcctgggtaaatgatctaga

25 Amino acid sequence:

30 MD FQ V Q I F S F L L I S A S V I A R G Q I V L S Q S P A I L S A S P G E K V T M T C R A S S S V S Y M H W Y
Q Q K P G S S P K P W T Y A P S N L A S G V P A R F S G S G S G T S Y S L T I S R V E A E D A A T Y Y C Q Q W S
F N P P T F G A G T K L E L K D G G G S G G G S G G G G S S Q A Y L Q Q S G A E S V R P G A S V K M S C K
A S G Y T F T S Y N M H W V K Q T P R Q G L E W I G A I Y P G N G D T S Y N Q K F K G K A T L T V D K S S S
T A Y M Q L S S L T S E D S A V Y F C A R V V Y Y S N S Y W Y F D V W G T G T T V T V S S D Q E P K S C D K
T H T S P P C S A P E L L G G P S V F L F P P K P K D T L M I S R T P E V T C V V V D V S H E D P E V K F N W Y
V D G V E V H N A K T K P R E E Q Y N S T Y R V V S V L T V L H Q D W L N G K E Y K C K V S N K A L P A P I
E K T I S K A K G Q P R E P Q V Y T L P P S R D E L T K N Q V S L T C L V K G F Y P S D I A V E W E S N G Q P E
N N Y K T T P P V L D S D G S F F L Y S K L T V D K S R W Q Q G N V F S C S V M H E A L H N H Y T Q K S L S L
35 S P G K

15. 2H7 scFv VH L11S IgE WCH2 WCH3 WCH4

Nucleotide sequence:

aagcttgccgcgcatggatttcaagtgcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
 40 ccagctgccagcaatcctgctgcatctccaggggagaaggtcacaatgacttgcaggggccagctcaagtgtaaagtacatgcact
 ggtaccagcagaagccaggatcctccccaaccctggattatgcccatccaacctggcttctggagtcctgctcgttcagtgc
 gcagtgggtctgggacctcttactcttcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagggtt
 taaccaaccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtggctcgggagggtgggtggatctggaggagggtg
 ggagctctcaggcttactacagcagctcggggctgaagctgtgaggcctggggcctcagtgaaagatgctcgaaggcttctgggt
 45 acacatttaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctattatccaggaaatg
 gtgatacttctacaatcagaagttaaggggcaaggccacactgactgtagacaatactccagcacagcctacatgcagctcagc
 agcctgacatctgaagactctgcggctatttctgtgcaagagtgggtgactatagtaactcttactggacttcgatgctcggggcaca
 gggaccacgggtcacccgtctcttctgacacgtctgctccagggaacttaccocgccaccgtgaagatcttacagtcgtcctgcgac
 ggcggggggacacttcccccgaccatccagctcctgtgcctcgtctctgggtacacccaggggactatcaacatcacttgctgg
 50 aggcaggggcaggtcatggacgtggacttgtccaccgccttaccacgcaggagggtgagctggcctccacacaaagcgagctc
 accttcagccagaagcactggctgtcagaccgcacctacacctgccaggtcacctatcaaggtcacacctttgaggacagcacca

WO 2005/017148

PCT/US2003/041600

agaagtgtgcagattccaacccgagaggggtgagcgctacctaagccggccagcccgttcacgtgttcacgcaagtcgc
ccacgatcacctgtctgggtggacctggcaccagcaaggggaccgtgaacctgacctgggtccggggccagtgggaagcct
gtgaaccactccaccagaaaggaggagaagcagcgcaatggcacgtaaacgtcacgtccaccctgccgggtgggcacccgag
actggatcgagggggagacctaccagtgcaggggtgaccacccccacctgcccagggccctcatgagggtccacgaccaagac
5 cagcgcccgctgctgccccggaagtctatgcgtttgcgacgcccggagtgccgggggagccgggacaaagcgcaccctcgcc
tgctgatccagaacttcatgcctgaggacatctcgggtgagtggtgcacaacgaggtgcagctcccgacgcccggcacagc
acgacgcagccccgcaagaccaagggtccggcttctcgtcttcagccgctggaggtgaccagggccgaatgggagcagaa
agatgagttcatctgcccgtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcggtgtctgtaaatcccggtaaa
tgataatctaga

10

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
15 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDHVCSRDF
PPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQ
EGELASTQSELTLSQKHWSLDRITYTCQVTYQGHTFEDSTKKCADSNPRGVSAYLS
RPSFDLFIKRSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLT
20 VTSTLPVGTDRDIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEW
PGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRL
EVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

16. 2H7 scFv VH L11S mIgE WCH2 WCH3 WCH4

25 Nucleotide sequence:

aagcttgcgccatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctcaccagcaatcctgtctgcatctccaggggagaaggtcacatgactgcagggccagctcaagtgaagtacatgcact
ggtagcagcagaagccaggtacctccccaaacctggattatgccccatcaacctggctctgagtcctctgctcctcagtg
gcagtggtctgggacctcttactcttcacaatcagcagagtgaggagctgaagatgctgccattattactgccagcagtgaggtt
30 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggagtg
ggagctctcaggttatctacagcagctggggctgagctgtgaggcctggggcctcagtgaaagatgctctgcaaggcttctggct
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gtgatacttctacaatcagaagttcaagggaagggcacactgactgtagacaaatctccagcacagcctacatgcagctcagc
agcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgtctggggcaca
35 gggaccacggtcaccgtctctctgatcaggttcgacctgtcaacatcactgagcccaccttgagctactccattcatcctgcgacc
ccaatgcattccactccaccatccagctgtactgtcttattatggccacatcctaataatgatgtctctgtcagctggtaatggacgatc
gggagataactgatacacttgacaaaactgttctaatacaggaggaaggcaactagcctctacctgcagtaaaactcaacatcactg
agcagcaatggatgtctgaaagcaccctcacctgcaaggtcacctcccaaggcgtagactattggccacactcgagatgccc
gatcatgagccacggggtgtgattacctacctgatccaccagccccctggacctgtatcaaaacgggtgtcccaagcttacctgt
40 ctggtggtggacctggaaagcgagaagaatgtcaatgtgacgtggaaccaagagaagaagacttcagctcagcatccagtggt
acactaagcaccacaataacgccacaactagatcacctccatctgcctgtagttgccaaggactggattgaaggctacggctatc
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tatgtgttccaccaccagaggaggagagcgaggacaaacgcacactcacctgtttgatccagaactcttccctgaggatattct
gtgcagtggtgggggatggcaactgatctcaaacgccagcagcagtagccacaacacccctgaaatccaatggctccaatcaa
45 ggcttcttcatcttcagtcgcttagaggtcgccaagacactctggacacagagaaaacagttcacctgccaagtgtccatgaggc
acttcagaaacccaggaaactggagaaaacaatatccacaagccttggtaacacctccctccgtccatcctagtaatactagag

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
50 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK

WO 2005/017148

PCT/US2003/041600

ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDHVRPVNIT
EPTLELLHSSCDPNAFHSTIQLYCFIYGHILNDVSVSWLMDDREITDTLAQTVLIKE
EGKLASTCSKLNITEQQWMSESTFTCKVTSQGVVDYLAHTRRCPDHEPRGVITYLIP
5 PSPLDLYQNGAPKLTCLVVDLESEKNVNVVTWNQEKKTSVSASQWYTKHHNNATT
SITSILPVVAKDWIEGYGYQCIVDHPDFPKPIVRSITKTPGQRSAPENVYVFPPEESEE
DKRTLTLCLIQNFFPEDISVQWLGDGKLISNSQHSTTTPLKSNQSNQGFIFSRLEVAK
TLWTQRKQFTCQVIHEALQKPRKLEKTISTSLGNTSLRPS

10 **17. 2H7 scFv VH L11S hIgA WH WCH2 T4CH3**

Nucleotide sequence:

aagcttgcgcgcattgatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaaggtcacatgacttcagggccagctcaagtgtaagttacatgcact
ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
15 gcagtggtctgggaccttactctctcacaatcagcagagtgaggagctgaagatgctgccacttattactgccagcagtgagattt
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gtgatacttctacaatcagaagttcaagggaagccacactgactgtagacaaatcctccagcacagcctacatgcagctcagc
20 agcctgacatctgaagactctgcggctctatttctgtgcaagagtggtgactatagtaactcttactgtacttcgatgtctggggcaca
gggaccacggtcaccgtctctctgatcagccagttccctcaactccacctacccatctccctcaactccacctacccatctccct
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accggcctgagagatgctcaggtgtcaccttcacctggacgccctcaagtgggaagagcgctgttcaaggaccacctgaccgtg
acctctgtggtgctacagcgtgtccagigtctgcgggctgtgccagccatggaacctgggaagaccttcacttgcactgct
25 gcttaccggagtcgaagaccccgctaaccgccacctctcaaaatccggaaacacattccggcccgaggtccacctgctgccg
ccggcgtcggaggagctggccctgaacgagctggtgacgctgacgtgcctggcacgtggcttcagccccagagatgtgtgtgtt
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ccaccttcgctgtgaccagcactactgcgcgtggcagccgaggactggaagaagggggacaccttctctgcatggtggggccacg
aggccctgccgctggccttcacacagaagaccatcgaccgcttggcgggtaaacccaccatgtcaatgtgtctgttgcacgtggcg
30 gagtggtgactgataatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
35 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQVPVSTPPT
PSPSTPPTPSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVITFTWTPSSG
KSAVQGGPPDRDLGCGYSVSSVLPGCAEPWNHKGKTFCTAAYPESKTPLTATLSKS
40 GNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKYLT
WASRQEPSQGTTFFAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDRLA
GKPTHVNVSVVMAEVD

18. 2H7 scFv VH L11S mIgA WH WCH2 T4 CH3

45 Nucleotide sequence:

aagcttgcgcgcattgatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaaggtcacatgacttcagggccagctcaagtgtaagttacatgcact
ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
gcagtggtctgggaccttactctctcacaatcagcagagtgaggagctgaagatgctgccacttattactgccagcagtgagattt
50 taaccacccacggtcgggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggtggtatctggaggaggtg
ggagctctcaggcttatctacagcagctctggggctgagctctgaggcctggggcctcagtgaaagatgctctgcaaggcttctggct

WO 2005/017148

PCT/US2003/041600

acacatttaccagttacaatatgcactgggtaaagcagacacctagacaggcctggaatggattggagctatttatccaggaaatg
gtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcagacgtacatgcagctcagc
agcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggtactctgatgtctggggcaca
gggaccacggtcaccgtctctctgatcacatctgttctcctactactcctcctccaccttctgccagcccagcctgtcactgca
5 gcggccagctcttgaggacgtgctcctgggttcagatgccagcatcacatgtactctgaatggcctgagagatcctgagggagctg
tcttcacctgggagccctccactgggaaggatgcagtgacagaagaagctgtgcagaattcctcggtctgacagtggtccagc
gtcctgcctggctgtgtgagcgtggaacagtggcgcatcattcaagtgcacagttaccatcctgagctgacaccttaactggc
acaattgccaaagtcacagtgaacaccttccaccccaggtccacctgtaccgccgccgtcggaggagctggccctgaatgag
ctcgtgctcctgacatgctggtgcgagcttcaaccctaaagaagtgtggtgcgatggctgcatggaatgaggagctgtcccc
10 agaaagctacctagtgtttgagcccctaaaggagccagggcagggagccaccacctacctggtgacaagcgtgtgcgtgtatca
gctgaaatctggaacagggtgaccagtactcctgcatggtgggccacgaggccttgcccatgaacttcaccagaagaccatcg
accgtctgtcgggtaaaccaccaatgtcagcgtgtctgtgatcatgtcagaggagattgataatctagat

Amino acid sequence:

15 MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWIYAPSNLASGVPARFSGSGSGTISYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDHICSPPTTP
20 PPPSCQPSLSLQRPALDLLLLGSDASITCTLNGLRDPEGAVFTWEPSTGKDAVQKK
AVQNSCGCYSVSSVLPGCAERWNSGASFKCTVTHPESDTLTGTLAKVTVNTFPPQV
HLLPPPSEELALNELVSLTCLVRAFNPKEVLVRWLHGNEELSPESYLVEPLKEPGE
GATTYLVTSVLRVSAEIWKQGDQYSCMVGHEALPMNFTQKTIDRLSGKPTNVSVS
VIMSEGD

25

A. mIgA WCH2 T4CH3

Nucleotide sequence:

Gttgtgatcacatctgttctcctactactcctcctccaccttctgccagcccagcctgtcactgcagcggccagctcttgagga
cctgctcctgggttcagatgccagcatcacatgtactctgaatggcctgagagatcctgagggagctgtcttcacctgggagccctc
30 cactgggaaggatgcagtgacagaagaagctgtgcagaattcctcggtctgacagtggtccagcgtcctgcctgctgtgctg
agcgttggaacagtggcgcatcattcaagtgcacagttaccatcctgagctgacaccttaactggcacaattgccaaagtcaca
gtgaacaccttccaccccaggtccacctgtaccgccgccgtcggaggagctggccctgaatgagctcgtgtccctgacatgcc
tggtgcgagcttcaaccctaaagaagtgtggtgcgatggctgcatggaatgaggagctgtccccagaaagctacctagtgtttg
agcccctaaaggagccagggcagggagccaccacctacctggtgacaagcgtgttgctgtatcagctgaaatctggaacagg
35 gtgaccagtactcctgcatggtgggccacgaggccttgcccatgaacttcaccagaagaccatcgaccgtctgtcgggtaaac
caccaatgtcagcgtgtctgtgatcatgtcagaggagattgataatctagat

Amino acid sequence:

40 DHICSPPTTPPPSCQPSLSLQRPALDLLLLGSDASITCTLNGLRDPEGAVFTWEPST
GKDAVQKKAVQNSCGCYSVSSVLPGCAERWNSGASFKCTVTHPESDTLTGTLAKV
TVNTFPPQVHLLPPPSEELALNELVSLTCLVRAFNPKEVLVRWLHGNEELSPESYL
VFEPLKEPGE GATTYLVTSVLRVSAEIWKQGDQYSCMVGHEALPMNFTQKTIDRL
SGKPTNVSVSVIMSEGD

45 20. K322S CH2 region

Nucleotide sequence:

cctgaactcctgggggaccgtcagttcttcttccccccaaacccaaggacacctcatgatctcccggaccctgaggtcac
atgcgtgggtggagctgagccacgaagacctgaggtcaagttaactgggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccgaggaggagcagtagaacagcacgtaccgtgtgtgcagcgtcctaccgtcctgaccaggactggctgaatg
50 gcaaggagtacaagtgtcgtcgtcctcaacaaagccctccagccccatcgagaaaacaatctccaaagccaaa

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIEKTISKAK

5

21. K322S CH2 WCH3

Nucleotide sequence:

cctgaactcctgggggaccgtcagtccttcttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcac
atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgtacgtggacggcgtggaggtgcataatgccaa
10 gacaaagccgcgggaggagcagtacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtgtcgtcgtcctcaacaaagccctccagccccatcgagaaaacaatctcaagccaaagggcagccc
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actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
15 atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIEKTISKAKG
20 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
LDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

1. K322L CH2 WCH3

Nucleotide sequence:

tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtcctcagcacctgaactcctggggggaccgtcagtccttct
cttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcacatgcgtggtggtggacgtgagccacgaaga
ccctgaggtcaagttcaactgtgtacgtggacggcgtggaggtgcataatgccaaagacaaagccgcgggaggagcagtaaca
gcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggagtacaagtcctggtctccaaca
agccctccagcctccatcgagaaaacaatctcaaaagccaaaggcagccccgagaaccacaggtgtacacctgccccat
30 cccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaaggcttctatccagcgacatcgccgtgagtggtg
agagcaatgggcagccggagaacaactacaagaccacgcctcccggtgtgactccgacggctccttctctctacagcaagct
caccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggtctgcacaaccactacacgca
gaagagcctctcctgtctccgggtaaatgatctaga

35 Amino acid sequence:

DQEPKSSDKTHTSPPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHED
PEVKFNWYVDGVEVHNNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCLV
SNKALPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVE
WESNGQPENNYKTPPVLDSDGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHN
40 HYTQKSLSLSPGK

22. 2H7 scFv VHL11S hIgG1 (SSS-S)H K322SCH2 WCH3

Nucleotide sequence:

aagcttgcgccatggaatttcaagtcagatttgcagtccttctgtaatacagtgcttcagtcataattgccagaggacaaattgttct
45 cccagctctccagcaatcctgtctgcatctccaggggagaaaggtcacatgaactgcagggccagctcaagtgttaattacatgcact
ggtaccagcagaagccaggatcctccccaaacctggaattatccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtggtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccactattactgccagcagtgaggtt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctggcggtggtgagctggaggaggtg
ggagctctcaggcttctacagcagctggggctgagtcggtgaggcctggggcctcagtgaaagatgctcgaaggcttctggc
50 tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
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WO 2005/017148

PCT/US2003/041600

cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggacttcgatgtctggggcac
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tacaagtgtcgggtctccaacaagccctccagcccccacgagaaaacaatctccaaagccaaagggcagccccgagaacca
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ctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgagg
10 cttgcacaaccactacacgcagaagagccctcctctgtcctgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWIYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
15 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIE
20 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

23. 2H7 scFv VHL11S hIgG1 (SSS-S)H K322LCH2 WCH3

Nucleotide sequence:

aagcttgccgcatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctcctcagcaatcctgtctgcatctccaggggagaaggtcacaatgactgcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggtacctccccaaacctggattatgccccatccaacctggcttctggagtcctgctcgttctcagtg
30 gcagtggtgtctggacgtcttactctctcacaatcagcagagtgagggtgaaagatgctgcccatttactgccagcagtgaggattt
taaccaccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggaggtg
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35 cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtagcttcgatgtctggggcac
agggaccacgggtaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcctcagcacctgaact
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cgcggggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
40 tacaagtgcctggtctccaacaagccctccagcccccacgagaaaacaatctccaaagccaaagggcagccccgagaacca
caggtgtacaccctgccccatcccggtatgagctgaccaagaaccagggtcagcctgacctgctggtcaaggcttctatcca
gcgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctcccggtgctggactccgacgg
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ctctgcacaaccactacacgcagaagagccctcctctgtcctgggtaaatgatctaga
45

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWIYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
50 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK

PCT/US2003/041600

375

WO 2005/017148

PCT/US2003/041600

Nucleotide sequence:

cctgaactcctgggggaccgtcagttcttcttccccccaaacccaaggacaccctcatgatctcccgaccctgaggtcac
atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgccaa
gacaaagccgcgggaggagcagtacaacagcagctaccgtgtgtgcagcgtcctaccgtcctgcaccaggactggctgaatg
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actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

10

Amino acid sequence

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIEKTISKAKG
QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
15 LDSDGSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLSPGK

27. 2H7 scFv VH L11S (SSS-S)H P331S CH2 WCH3

Nucleotide sequence:

aagcttgcgcctgatttcaagtgcagatttgcagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgtctct
20 cccagctcctcagcaatcctgtctgcatctccaggggagaagggtcacaatgactgcagggccagctcaagtgtaatgtacatgcact
ggtaccagcagaagccaggtatcctcccccacccctggaattatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagttt
taaccacccacgttcggtgtctgggaccaagctggagctgaaagatggcgggtggtcgggcggtggtggtatcgaggaggtg
ggagctctcaggcttatctacagcagcttggtggtgagtggtgagcctggggcctcagtgaaagatgctcgaagccttctggc
25 tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
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30 tgggtgacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgccaaagacaagc
cgcgaggaggagcagtacaacagcacgtaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtctccaacaagccctccagcctcatcgagaaaacaatctcaaagccaaagggcagccccgagaacca
caggtgtacacctgccccatcccggtatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaaggcttctatccca
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35 ctcttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgagg
ctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

35

Amino acid sequence

MDFQVQIFSFLISASVIIARGQIVLSQSPAILASPGKEKVTMTCRASSSVSYMHWY
40 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
45 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPN
NYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLS
PGK

50

28. 2H7 scFv VH L11S (CSS-S)H P331S CH2 WCH3

WO 2005/017148

PCT/US2003/041600

Nucleotide sequence:

aagcttgccgccatggatttcaagtcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
cccagctctccagcaatctgtctgcatctccaggggagaaggtcacatgactgcagggccagctcaagtgtaagttacatgcact
ggtagcagcagaagccaggatcctccccaaacctggalltatgccccatccaacctggcttctggagtcctctgctcgttcagt
5 gtagtgggtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagttt
taaccacccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggagtg
ggagctctcaggcttactacagcagctggggctgagtcggtaggcctggggcctcagtgagatgctcgaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagtcaaggccaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
10 cagcctgacatctgaagactctgcggctatttctgtgcaagagtggtgactatagtaacttactggtacttctgatctctgggcac
agggaccacgggtcaccgtctctctgatcaggagcccaatctgtgacaaaactcacacatccccaccgtctcagcactgaact
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15 tacaagtgaaggtctccaacaagccctccagcctccatcgagaaaacaatctccaagccaaaggcgagccccgagaacca
caggtgtacacctgcccccatcccggtgagctgaccaagaaccaggtcagcctgacctgctgcaaggcttctatcca
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ctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgttctctatgctcctgatgatgagg
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20

Amino acid sequence

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
25 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDQEPKSCDK
THTSPSSAPELGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
30 NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSQVMHEALHNHYTQKSLSLS
PGK

29. T256N CH2 region

Nucleotide sequence:

Cctgaactcctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaaacctgaggtca
catgcgtgggtggtagcgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcca
agacaaagccgcgggaggagcagtagaacagcacgtaccgtgtggtagcgtcctaccgtcctgaccaggactggctgaat
ggcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctccaagccaaa

Amino acid sequence

PELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

30. T256N CH2 WCH3

Nucleotide sequence:

cctgaactcctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaaacctgaggtcac
atgcgtgggtggtagcgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcca
gacaaagccgcgggaggagcagtagaacagcacgtaccgtgtggtagcgtcctaccgtcctgaccaggactggctgaatg
gcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctccaagccaaaggcagccc
cgagaaccacaggtgtacacctgcccccatcccggtgagctgaccaagaaccaggtcagcctgacctgctgctaaagg
50 ctctatccacgcgacatcgccgtggagtgaggagcaatgggcagccggagacaactacaagaccacgcctccctgctggtg

WO 2005/017148

PCT/US2003/041600

actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

5 PELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTKISKAKG
QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

10 31. 2H7 scFv VH L11S (SSS-S)H T256N CH2 WCH3

Nucleotide sequence:

aagcttgcggccatgattttcaagtgcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaattacatgcact
15 ggtaccagcagaagccaggatcctcccccacccctggatttatccccatccaacctggcttctggagtcctctgctcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcgggcgggtggatctggaggaggtg
ggagctctcaggttatctacagcagctctgggctgagtcggtaggcctgggcctcagtgaaatgctcgaagcctctggc
tacacattaccagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctattatccaggaat
20 ggtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaacttactgggtactcgtatctggggcac
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25 cggggaggagcagtagaacagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactgggtgaatggcaaggag
tacaagtcaaggctccaacaagccctccagcccccagcagaacaaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgactgaccaagaaccaggtcagcctgacctgcctgggtcaaggcttctatccc
agcgacatcgccgtggagtgaggagcaatgggcagccggagaaactacaagaccacgctcccgctgctggactccgacg
gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
30 gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
35 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
40 EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

45 32. 2H7 scFv VH L11S (CSS-S)H T256N CH2 WCH3

Nucleotide sequence:

aagcttgcggccatgattttcaagtgcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaattacatgcact
50 ggtaccagcagaagccaggatcctcccccacccctggatttatccccatccaacctggcttctggagtcctctgctcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcgggcgggtggatctggaggaggtg

WO 2005/017148

PCT/US2003/041600

ggagctctcaggettattacagcagctctggggctgagtcggtgaggcctggggcctcagtgagatgtctcgaaggcttctggc
tacacatttaccaggtacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttaccaggaaaf
ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtgactatagtaactcttactggctacttcgatgtctggggcac
5 agggaccacggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcctcagcacctgaact
cctgggggggaccgtcagctctctctccccccaaaacccaaggacaccctcatgatctcccgaaacctgaggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgccaaagacaagc
cgcgaggagagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgcagggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcgagccccgagaacc
10 acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacg
gtcctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

15 Amino acid sequence
MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
20 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRNPVTCVVVDVSHEDPEVKFNWY
VDGVEVHNATKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
25 SPGK

33. RTPE/QNAK (255-258) CH2

Nucleotide sequence:

cctgaactcctggggggaccgtcagctcttctcttccccccaaaacccaaggacaccctcatgatctcccagaacgtaaggtcac
30 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccgcgggaggagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaagccaaagccaa

Amino acid sequence

35 PELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

34. RTPE/QNAK (255-258)CH2 WCH3

Nucleotide sequence:

cctgaactcctggggggaccgtcagctcttctcttccccccaaaacccaaggacaccctcatgatctcccagaacgtaaggtcac
40 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccgcgggaggagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaagccaaagggcagccc
cgagaaccacaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtcaaaagg
45 ctctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctgg
actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

50 PELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG

WO 2005/017148

PCT/US2003/041600

QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

35. 2H7 scFv VH L11S (SSS-S)H RTPE/QNAK (255-258)CH2 WCH3

5

Nucleotide sequence:

aagcttccgccatggatttcaagtcagatttccagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaattacatgcact
ggtagcagcagaagccagatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
10 gcagtggtctgggacctcttactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggatctggaggagtg
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15 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactggtagcttgcagctctggggcac
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20 tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
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gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

25

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILASAPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
30 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISQNAKVTCTVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
35 NNYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

36. 2H7 scFv VH L11S (CSS-S)H RTPE/QNAK (255-258)CH2 WCH3

Nucleotide sequence:

aagcttccgccatggatttcaagtcagatttccagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaattacatgcact
ggtagcagcagaagccagatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
40 gcagtggtctgggacctcttactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggtt
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ggagctctcaggcttatctacagcagctggggctgagtcggtgagggcctggggcctcagtgaaagatgctcgaaggtcttggc
45 tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
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50 cctggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccagaacgctaaggtcacatgcgtgg
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WO 2005/017148

PCT/US2003/041600

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acaggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctggctaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccgggagaaactacaagaccacgcctcccgtgctggactccgacg
5 gctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
10 QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
15 THTSPSSAPELLGGPSVFLFPPKPKDTLMISQNAKVTCTVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

20 36. K290Q CH2 region

Nucleotide sequence:

cctgaactcctgggggaccgtcagctcttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
atgctgtgtgtggacgtgagccacgaagaccctgaggtcaagtcaactgtacgtggacggcgtggaggtgcataatgcaa
25 gacacagccgaggaggagcagtacaacagcacgtaccgtgtgtcagcgtctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaa

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

30

37. K290Q CH2 WCH3

Nucleotide sequence:

Cctgaactcctgggggaccgtcagcttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtca
catgctgtgtgtggacgtgagccacgaagaccctgaggtcaagtcaactgtacgtggacggcgtggaggtgcataatgcca
35 agacacagccgaggaggagcagtacaacagcacgtaccgtgtgtcagcgtctcaccgtcctgcaccaggactggctgaat
ggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcagcc
ccgagaaccacaggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtcaaaag
gcttctatcccgacatcgccgtggagtgggagagcaatgggcagccgggagaaactacaagaccacgcctcccgtgctg
gactccgacggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgt
40 gatgcatgaggctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG
45 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

38. 2H7 scFv VH L11S (SSS-S)H K290Q CH2 WCH3

Nucleotide sequence:

aagcttgcggccatggatttcaagtgcagatttcagcttctgtaaatcagtgcttcagtcataattgccagaggacaaattgttctct
50 cccagctctccagcaatcctgtctgcactctccaggggagaaggtcacaatgacttcagggccagctcaagtgtaagttacatgcact

WO 2005/017148

PCT/US2003/041600

ggtaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgcttcagt
gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacggttcggtgctgggaccaagctggagctgaaagatggcggaggctcggcggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
5 tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaagggaagggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggacttctgatctggggcac
agggaccacgggtcaccgtcttctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttcttcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
10 tgggtggacgtgagccacgaagacctgaggtcaagttcaactggtagcgtggacggcgtggaggtgcataatgcaagacacagc
cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggag
tacaagtgaaggttccaacaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtaaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccagcctcccgctggtgactccgacg
15 gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVILARGQIVLSQSPAILASPGKEKVTMTCRASSSVSYMHWY
20 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFVDVWGTGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
25 DGVEVHNAKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

39. 2H7 scfv VH L11S (CSS-S)H K290Q CH2 WCH3

Nucleotide sequence:

aagcttgcgccatggatttcaagtcagatttcaagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctccagcaatcctgtctgcactccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
ggtagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgcttcagt
35 gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacggttcggtgctgggaccaagctggagctgaaagatggcggaggctcggcggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaagggaagggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
40 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggacttctgatctggggcac
agggaccacgggtcaccgtcttctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttcttcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
tgggtggacgtgagccacgaagacctgaggtcaagttcaactggtagcgtggacggcgtggaggtgcataatgcaagacacagc
cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggag
45 tacaagtgaaggttccaacaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtaaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccagcctcccgctggtgactccgacg
gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

WO 2005/017148

PCT/US2003/041600

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 FNPPTFGAGTKLELKDGGGSGGGGSGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
 5 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYDVGWGTGTTVTVSSDQEPKSCDK
 THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
 DGVEVHNAKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
 NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLS
 10 PGK

40. A339PCH2

Nucleotide sequence:

cctgaactcctgggggaccgtcagttcttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
 15 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttaactggtacgtggacggcgtggaggtgcataatgcaa
 gacaagccgcgggaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtcgtcaccaggactggctgaatg
 gcaaggagtacaagtgcagggtctccaacaagccctcccagccccatcgagaaaacaatctcaaacccaa

Amino acid sequence:

20 PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
 AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKPK

41. A339P-CH2 WCH3

25 Nucleotide sequence:

cctgaactcctgggggaccgtcagttcttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttaactggtacgtggacggcgtggaggtgcataatgcaa
 gacaagccgcgggaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtcgtcaccaggactggctgaatg
 gcaaggagtacaagtgcagggtctccaacaagccctcccagccccatcgagaaaacaatctcaaacccaaagggcagccc
 30 cgagaaccacaggtgtacaccctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaagg
 ctctatccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgctgctgg
 actccgacggctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctcgtg
 atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgctcgggtaaatgatctaga

35 Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
 AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKPKG
 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
 40 LDSGDSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLSPGK

42. 2H7 scFv VHL11S (SSS-S)H A339P CH2 WCH3

Nucleotide sequence:

aagcttgccgccatggatttcaagtgcagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
 cccagctctccagaatctgtctgcatctccaggggagaaggtcacaaatgacttgaggccagctcaagtgttaagtacatgcact
 45 ggtaccagcagaagccaggatctccccaaacccctggatttatccccatccaacctggctctggagtcctgtcgtctcagtg
 gcagtggtgtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggtt
 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggtcggcggtgtggtatctggaggaggtg
 ggagctctcagcttatctacagcagcttggggctgagtcggtgaggcctggggcctcagtgaaatgctcgtcaaggcttctggc
 tacacattaccagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaaat
 50 ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
 cagcctgacatctgaagactctcggtctatttctgtgcaagagtggtgtactatagtaactcttactggtacttcgatgtctggggcac

WO 2005/017148

PCT/US2003/041600

agggaccacgggtcaccgtctctctgatcaggagcccaaatctcttgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctctcccccaaaacccaaggacaccctcatgatctccggaccctgagggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagtcaactggtagtggtggcgtggaggtgcataatgccaagacaaagc
cgcgaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactgggtgaatggcaaggag
5 tacaagtgcagggtctcaacaaagccctcccagccccatcgagaaaacaatctccaaacccaagggcagccccgagaacc
acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctggactccgacg
gtctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

10

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
15 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKPKGQPPEPVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
20 NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
PGK

43. 2H7 scFv VHL11S (CSS-S)H A339P CH2 WCH3

25 Nucleotide sequence:

aagcttgccgccattgatttcaagtcagatttccagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggtcacatgacttcagggccagctcaagtgttaattcatgcact
ggtagcagcagaagccaggtatctccccaaacctggatttatccccatccaacctggcttctggagtcctgtcgtctcagtg
gcagtgggtctgggaacctctactctctcaaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggatt
30 taaccacccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtgctcggcggtgggtgagctggaggaggtg
ggagctctcaggttatctacagcagctgggggtgagtcggtaggcctggggcctcagtgaaatgctcctgcaagcctctggc
tacacattaccagttacaatatgactgggtaagcagacacctagacagggcctggaatggattggagctattatccagggaat
ggtagacttctacaatcagaagtcaagggcaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactggtacttcgatgtctggggcac
35 agggaccacgggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctctcccccaaaacccaaggacaccctcatgatctccggaccctgagggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagtcaactggtagtggtggcgtggaggtgcataatgccaagacaaagc
cgcgaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactgggtgaatggcaaggag
tacaagtgcagggtctcaacaaagccctcccagccccatcgagaaaacaatctccaaacccaagggcagccccgagaacc
40 acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctggactccgacg
gtctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

45 Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
50 TAYMQLSSLTSEDSAVYFCARVVYYNSNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV

WO 2005/017148

PCT/US2003/041600

DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKPKGQPREEQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVSCSVMHEALHNHYTQKSLSLS
PGK

5

44. G28-1VH

Nucleotide sequence:

gcgggtccagctgcagcagctggacctgagctgaaaagcctggcgcttcagtgagatttctgcaaggcttctggttactcattc
10 actggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtgattggaaatattgatccttattatggtggtacta
cctacaaccgggaagtcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctctgac
atctgaggactctgcagctctattactgtgcaagatcggtcgccctatggactactgggggtcaaggaacctcagtcaccgtctctct
gatcag

15 Amino acid sequence:

AVQLQQSGPELEKPGASVKISCKASGYSFTGYNMNWVKQNNGKSLEWIGNIDPY
YGGTTYNRKFKGKATLTVDKSSSTAYMQLKSLTSEDSAVYYCARSVGPMDYWG
QGTSTVTVSSDQ

20 45. G28-1VL

Nucleotide sequence:

aagcttgcggccatggtatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgttacagttatttggcttgg
atcagcagaaacagggaatatctcctcagctcctggctcttttgcacaaaccttagcagaaggtgtgccatcaagggtcagtgga
25 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcgggtggaggcaccgaactggagatcaaaaggtggcgggtggctcgggcgggtgggtgggtcgggtggcggcgat
cgta

Amino acid sequence:

30 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSS

35 46. G28-1 scFv

Nucleotide sequence:

aagcttgcggccatggtatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgttacagttatttggcttgg
atcagcagaaacagggaatatctcctcagctcctggctcttttgcacaaaccttagcagaaggtgtgccatcaagggtcagtgga
40 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcgggtggaggcaccgaactggagatcaaaaggtggcgggtggctcgggcgggtgggtgggtcgggtggcggcgat
cgtcagcgggtccagctgcagcagcttgacctgagctgaaaagcctggcgcttcagtgagatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccgggaagtcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
45 gacatctgaggactctgcagctctattactgtgcaagatcggtcgccctatggactactgggggtcaaggaacctcagtcaccgtctc
ttctgatcag

Amino acid sequence:

50 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQQSGPELEKPGASVKISCKA

WO 2005/017148

PCT/US2003/041600

SGYSFTGYNMNWWVKQNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQ

5 **47. G28-1 VHL11S**

Nucleotide sequence:

gcgggtccagctgcagcagctcggacctgagtcggaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttactcattc
actggtcacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggtacta
cctacaaccggaagttcaaggggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctgac
10 atctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctctct
gatcag

Amino acid sequence:

15 AVQLQQSGPESEKPGASVKISCKASGYSTGYNMNWWVKQNNGKSLEWIGNIDPYY
GGTTYNRKFKGKATLTVDKSSSTAYMQLKSLTSEDSAVYYCARSVGPMDYWGQ
GTSVTVSSDQ

20 **48. G28-1 VHL11S scFv**

Nucleotide sequence:

aagcttgcgcgatggtatccacagctcagttccttgggttgctgctgctgtggcttacagtggtgcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttggcttgg
atcagcagaacagggaaaatctctcagctcctggtctcttttgcacaaaccttagcagaaggtgtccatcaaggctcagtgga
25 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagttatttctgcaacatcattccgataat
ccgtggacgttcgggtggagccaccgaactggagatcaaaaggtggcgggtgctcggcggtgggtgggtgggtggcgccgat
cgtcagcgggtccagctgcagcagcttgacctgagtcgaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccggaagttcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
30 gacatctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctc
ttctgatcag

Amino acid sequence:

35 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQKQKQKSPQLLVSFAKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHH
DNPWTFGGGTELEIKGGGSGGGSGGGGSSAVQLQQSGPESEKPGASVKISCKA
SGYSFTGYNMNWWVKQNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQ

40 **49. G28-1 scFv (SSS-S)H WCH2 WCH3**

Nucleotide sequence:

aagcttgcgcgatggtatccacagctcagttccttgggttgctgctgctgtggcttacagtggtgcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttggcttgg
atcagcagaacagggaaaatctctcagctcctggtctcttttgcacaaaccttagcagaaggtgtccatcaaggctcagtgga
45 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagttatttctgcaacatcattccgataat
ccgtggacgttcgggtggagccaccgaactggagatcaaaaggtggcgggtgctcggcggtgggtgggtgggtggcgccgat
cgtcagcgggtccagctgcagcagcttgacctgagtcgaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccggaagttcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
50 gacatctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctc
ttctgatcatgatcaggagcccaaatcttctgacaaaactcacacatcccaccgtcctcagcactgaactcctgggggggaccgtc

WO 2005/017148

PCT/US2003/041600

agtcttctcttcccccaaaacccaaggacacctcatgatctcccgaccctgaggtcacatgcgtggtggtggacgtgagcc
 acgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatccaagacaaagccgaggaggagca
 gtacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaaggagtacaagtgaagggtc
 tccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaaccacaggtgtacacct
 5 gccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgcaaaggcttctatcccagcgacatcgccgtg
 gagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacggctccttctctctac
 agcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgaggtctgcacaaccact
 acacgcagaagagcctctcctgtctccgggtaaatgatctaga

10 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLAW
 YQQKQGKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
 DNPWTFGGGTELEIKGGGGSGGGSGGGSSAVQLQQSGPELEKPGASVKISCKA
 SGYSFTGYNMNWKQNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
 15 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDHDQEPKSSDKTHTSP
 PSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE
 VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK
 AKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKT
 TPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

20

50. G28-1 scFv IgAW H IgG1WCH2 WCH3

Nucleotide sequence:

aagettccgccatglatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
 agtctccagctccctatctgcatctgtggagagactgtcaccatcacatgtcgaacaagtgaatatgtttagatttggcttggt
 25 atcagcagaacagggaaaatctcctcagctcctggctcttttgcaaaaacctagcagaaggtgtgccatcaagggtcagtgga
 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgcaacatcattccgataat
 ccgtggacgttcggtggagccaccgaactggagatcaaaagtgccggctggcgggtgggtgggtggcggcgat
 cgtcagcgggtccagctgcagcagctgtgacctgagctggaaaagcctggcgcttcagtgaaattctgcaaggcttctgttact
 cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtggaattgaaatattgatccttattatggtgt
 30 actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatctccagcacagcctacatgcagctcaagagctc
 gacatctgaggactctgcagcttattactgtgaagatcggtcggccctatggactactggggtcaaggaaacctcagtcaccgtctc
 ttctgatcagccagttccctcaactccacctacccatctccctcaactccacctacccatctccctcatcgccacctgaactcctgg
 gggacccgtcagttctcttcccccaaaacccaaggacacctcatgatctcccgaccctgaggtcacatgcgtggtggtg
 gacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatccaagacaaagccgag
 35 ggaggagcagtcacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaaggagtacaa
 gtgcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaaccacagg
 tgfacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgcaaaggcttctatcccagcga
 catcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacggctcct
 tctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgaggtctg
 40 cacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLAW
 YQQKQGKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
 45 DNPWTFGGGTELEIKGGGGSGGGSGGGSSAVQLQQSGPELEKPGASVKISCKA
 SGYSFTGYNMNWKQNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQVPSTPPTPSPSTPPT
 PSPSCAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDG
 VEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTI
 50 SKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNY

WO 2005/017148

PCT/US2003/041600

KTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPG
K

51. **G28-1 scFv VHL11S (SSS-S)H WCH2 WCH3**

5 Nucleotide sequence:

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctggttacaggtggcagatgtgacatccagatgactc
agtcctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaataatgtttacagtatttgcttggg
atcagcagaaacagggaaaatctctcagctcctggtctctttgcaaaaaccttagcagaaggtgtccatcaagggtcagtgga
gtggatcaggcacacagttttctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
10 ccgtggacgttcggtggagggcaccgaactggagatcaaaaggtggcgggtggtcggcggtggtgggtggcggtggcggtggt
cgtcagcgggtcagctgcagcagctgtgacctgagtcggaaaagcctggcgcttcagtgaaatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagaccttgatggattggaaatattgatccttattatggtggt
actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
gacatctgaggactctgcagctctattactgtgaagatcggtcggccctatggactactgggtgcaaggaaacctcagtcaccgtctc
15 ttctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaactcctggggggaccgtcagctctt
cctcttcccccaaaacccaaggacacctcatgatctccggacccttgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagttcaactggtacgtggacggcggtggaggtgcataatgccaagacaaagccggggaggagcagtagacaa
cagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgcagggtctccaac
aaagccctcccagccccatcgagaaaacaatctccaagccaaagggcagccccgagaaccacaggtgtacacctgcccc
20 atccgggatgagctgaccaagaaccaggtcagcctgacctggtcgaaggcttctatcccagcgacatcgccgtggagtggtg
gagagcaatgggcagccggagaaacaactacaagaccacgctcctcgtggtgactccgacggctccttctctctacagcaag
ctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggctctgcacaaccactacacgc
agaagagcctctcctgtctccggtaaatgatctaga

25 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTTTCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLQPEDSGSYFCQHH
DNPWTFGGGTELEIKGGGGSGGGSGGGGSSAVQLQSGPSEKPGASVKISCKA
SGYSFTGYNMNWKQNNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
30 AYMQLKSLTSEDSAVYYCARSVGPM DYWGQGTSTVTVSSDHDQEPKSSDKTHTSP
PSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNWYVDGVE
VHNAKTKPREEQYNSTYRVVSVLTVHLQDNLNGKEYKCKVSNKALPAPIEKTISK
AKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKT
TPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
35

52. **G28-1 scFv VHL11S (CSS-S)H WCH2 WCH3**

Nucleotide sequence:

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctggttacaggtggcagatgtgacatccagatgactc
agtcctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaataatgtttacagtatttgcttggg
40 atcagcagaaacagggaaaatctctcagctcctggtctctttgcaaaaaccttagcagaaggtgtccatcaagggtcagtgga
gtggatcaggcacacagttttctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcggtggagggcaccgaactggagatcaaaaggtggcgggtggtcggcggtggtgggtggcggtggcggtggt
cgtcagcgggtcagctgcagcagctgtgacctgagtcggaaaagcctggcgcttcagtgaaatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagaccttgatggattggaaatattgatccttattatggtggt
45 actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
gacatctgaggactctgcagctctattactgtgaagatcggtcggccctatggactactgggtgcaaggaaacctcagtcaccgtctc
ttctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaactcctggggggaccgtcagctctt
cctcttcccccaaaacccaaggacacctcatgatctccggacccttgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagttcaactggtacgtggacggcggtggaggtgcataatgccaagacaaagccggggaggagcagtagacaa
50 cagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgcagggtctccaac
aaagccctcccagccccatcgagaaaacaatctccaagccaaagggcagccccgagaaccacaggtgtacacctgcccc

PCT/US2003/041600

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WO 2005/017148

PCT/US2003/041600

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttgcttggt
atcagcagaacagggaatatctcctcagctcctggtctcttttgcacaaaccttagcagaagggtgcatcaagggtcagtgga
gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
5 ccgtggacgttcggtggagggaccgaactggagatcaaaagggtggcgggtggctcgggcgggtgggtgggtcgggtggcggcgat
cgtcagcgggtccagctgcagcagctgtgacgtgagtcgaaaagcctggcgctcagtgaaagtcttgcagggtctgtgttact
cattcactggctacaataatgaactgggtgaagcagaataatggaagagccttgagtgagtgaaatattgatccttattatggtgt
actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagct
gacatctgaggactctgcagctctattactgtcaagatcggtcgccctatggactactgggtcaaggaaacctcagtcaccgtctc
10 tctgatcaggagcccaaatctctgacaaaactcacacatccccaccgtgcccagcacctgaactcctggggggaccgtcagctct
cctctccccccaaaacccaaggacacctcatgatctccggaccttgaggtcacatgcgtggtgggtggacgtgagccacgaa
gacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcaagacaagccgcgggaggagcagtacaa
cagcacgtaccgtgtgtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggagtacaagtgaagggtctccaac
aaagccctcccagccccatcgagaaaacaatctcaaaagccaaagggcagccccgagaaccacaggtgtacacctgcccc
15 atccgggatgagctgaccaagaaccagggtcagcctgacctgctgctaaaggctctatccagcgacatcgccgtggagtg
gagagcaatgggcagccggagagaacaactacaagaccacgctcctcgtgctggactccgacggctccttctctctacagcaag
ctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgcatgaggtctctgcacaaccactacacgc
agaagagcctctcctgtctccggtaaatgatctaga

20 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLQPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQQSGPESEKPGASVKISCKA
SGYSFTGYNMNWKQNNKSLWIGNIDPYGGTTYNRKFKGKATLTVDKSSST
25 AYMQLKSLTSEDSAVYYCARSVGPM DYWGQTSVTVSSDQEPKSSDKTHTSPPCP
APELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNWYVDGVEVH
NAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK
GQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSDGSFFLYSKLTVDKSRWQQGNV FSCSVMHEALHNHYTQKSLSLSPGK
30

II. 54. HCTLA4 HIGG1 (SSS-S)H P238SCH2 WCH3

Nucleotide sequence:

atggcttccttgatttcagcggcacaaggctcagctgaacctggctgccaggacctggcctgcactctcctgtttttctctctc
atcctgtctcttgcaaaagcaatgcacgtggccagcctgtgtggtactggccagcagccgaggtatcgccagcttctgtgtga
35 gtatgcacatccaggcaaaagccactgaggtccgggtgacagtgttcggcaggtgacagccaggtgactgaagtctgtcgggc
aacctacatgacgggaatgagttgacctcttagatgattccatctgcacgggcacctccagtgaatacaagtgaacctcactat
ccaaggactgagggccatggacacgggactctacatctgcaagggtggagctcatgtacccaccgccatactacctgggcatagg
caacggaaccagatttatgtaattgatccagaacctgcccagattctgatcaacccaaatctctgacaaaactcacacatcccca
cgtcctcagcactgaactcctggggggatcgtcagttctcttccccccaaaacccaaggacacctcatgatctccggac
40 cctgaggtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggt
gcataatgcaagacaagccgcgggaggagcagtagaacagcacgtaccgtgtgtcagcgtcctcaccgtctgcaccagg
actggctgaatggcaaggagtacaagtgaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagcca
aagggcagccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgc
ctgtcaaaaggctctatccagcgacatcgccgtggagtgaggagcaatgggcagccggagaaacaactacaagaccacgcc
45 tccgtgctgactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctct
catgctccgtgatgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatga

Amino acid sequence:

MACLGFRHKAQLNLAARTWPCTLLFFLLFIPVFCKAMHVAQPAVV LASSRGIAS
50 FVCEYASPGKATEVRVTVLRQADSQVTEVCAATYMTGNELTFLDDSICTGTSSGN

WO 2005/017148

PCT/US2003/041600

QVNLTIQGLRAMDTGLYICKVELMYPPPYLIGINGTQIYVIDPEPCPDSDQPKSSD
KTHTSPPSSAPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
5 NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSFSVMHEALHNHYTQKSLSL
SPGK

55. FC2-2 VL

Nucleotide sequence:

10 gttgtaagcttgccgccatggattcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtccagtcagagccctttatataatcacaat
caaaagaactacttggcctgttaccagcagataaccaggcagctctcctaaactgctgatttactgggcacccactaggggaatctgg
ggtccctgatcgcttcacaggcagtggtatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
15 ttactgtcagcaatattatactatcctccacgttcggaggtggcaccagctggaaataaaaaggtggcgggtgctcgggcgggtg
gtgggtcgggtggcggcgggagctcg

Amino acid sequence:

MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
20 VYYCQQYYTYPPTFGGG TKLEIKGGGSGGGGSGGGGSS

56. FC2-2VH

Nucleotide sequence:

Gggagctcgcaggtgcagttgaaggagtcaggacctggcctggcggccctcacagagcctgtccatcacatgcaccgtctca
25 ggggtctcaftaaccgtctatgggttaactgggttcgccagcctccaggaaagggtctggactggcgggaatgatatggggat
ggaagcacagactataattcagctctcaatccagactgagcatcagtaaggacaactccaagagccaagtttcttaaaatggac
agtctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatggactactggggcaagga
acctcagtcaccgtctcctctgatcag

30 Amino acid sequence:

GSSQVQLKESGPGLVAPSQSL SITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMIW
GDGSTDYNSALKSRLSISKDNSKSQVFLKMDSLQTDDTARYYCARDHYGTHYAM
DYWGQGTSTVTVSSDQ

35 57. FC2-2scFv

Nucleotide sequence:

gttgtaagcttgccgccatggattcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtccagtcagagccctttatataatcacaat
caaaagaactacttggcctgttaccagcagataaccaggcagctctcctaaactgctgatttactgggcacccactaggggaatctgg
40 ggtccctgatcgcttcacaggcagtggtatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatactatcctcccacgttcggagggtggcaccagctggaaataaaaaggtggcgggtggtcgggcgggtg
gtgggtcgggtggcggcgggagctctcaggtgcagttgaaggagtcaggacctggcctggtggcggccctcacagagcctgtcc
atcacatgcaccgtctcaggttctcattaaccgtctatggtgtaactgggttcgccagcctccaggaaagggtctggactggctgg
gaatgatatgggtgatggaagcacagactataattcagctctcaatccagactgagcatcagtaaggacaactccaagacca
45 gttttcttaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
actactggggtaaggaacctcagtcaccgtctcctctgatcag

Amino acid sequence:

MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
50 QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
VYYCQQYYTYPPTFGGG TKLEIKGGGSGGGGSGGGGSSQVQLKESGPGLVAPSQ

WO 2005/017148

PCT/US2003/041600

SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYAMDYWGQGTSVTVSSDQ

58. FC2-2 VHL11S

5 Nucleotide sequence:
gggagctctcaggtgcagttgaaggagtcaggacctggctcggcggccctcacagagcctgtccatcacatgcaccgtctcag
gggtctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggggaatgatatggggtgatg
gaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaagtttctaaaaatggaca
gtctacaaactgatgacacagccaggtactactgtgccagagatcactatgggtaccactatgctatggactactggggtcaaggaa
10 cctcagtcaccgtctcctctgatcag

Amino acid sequence:
(GSS)QVQLKESGPGSVAPSQSLTCTVSGFSLTVYGVNWVRQPPGKGLDWLGM
WGDGSTDYNSALKSRLSISKDNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYA
15 MDYWGQGTSVTVSSDQ

59. FC2-2 VH L11S scFv

Nucleotide sequence:
gttgtaagcttgcggccatggattcacaggcccaggttctatgttactgctgctatgggtatctgtgtacctgtggggacattgtgatg
20 tcacagctctccatcctcctagctgtgtcagttggagagaagggttctatgagctgcaagtcagtcagagcctttatataatcacaat
caaaagaactacttggcctgtgaccagcagataccagggcagctctcctaaactgctgatttactgggcatccactagggaatctgg
ggtcctgatcgttcacaggcagtgatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatcctatcctcccagctcggaggtggcaccagctggaaataaaagggtggcggtggtcggcggtg
25 gtgggtcgggtggcggggagctctcaggtgcagttgaaggagtcaggacctggctcgggtggcgccctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gttttctaaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatgggtaccactatgctatgg
actactgggggtcaaggaaacctcagtcaccgtctcctctgatcag

30 Amino acid sequence:
MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
VYYCQQYYTYPPTFGGGTKLEIKGGGGSGGGGSGGGGSSQVQLKESGPGSVAPSQ
SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMWGDGSTDYNSALKSRLSISK
35 DNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYAMDYWGQGTSVTVSSDQ

60. FC2-2 (SSS-S)H WCH2 WCH3

Nucleotide sequence:
gttgtaagcttgcggccatggattcacaggcccaggttctatgttactgctgctatgggtatctgtgtacctgtggggacattgtgatg
40 tcacagctctccatcctcctagctgtgtcagttggagagaagggttctatgagctgcaagtcagtcagagcctttatataatcacaat
caaaagaactacttggcctgtgaccagcagataccagggcagctctcctaaactgctgatttactgggcatccactagggaatctgg
ggtcctgatcgttcacaggcagtgatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatcctatcctcccagctcggaggtggcaccagctggaaataaaagggtggcggtggtcggcggtg
45 gtgggtcgggtggcggggagctctcaggtgcagttgaaggagtcaggacctggcctgggtggcgccctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gttttctaaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatgggtaccactatgctatgg
actactgggggtcaaggaaacctcagtcaccgtctcctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcct
cagcacctgaactcctgggtggaccgtcagcttctcttccccccaaaacccaaggacacctcatgatctccggacctctgag
50 gtcacatgcgtgggtgggacgtgagccacgaagacctgaggtcaagttcaactgtgtacgtggacggcgtggaggtgcataat
gccaaagacaagccgcgggaggagcagtaacacagcagtcaccgtgtgtgtcagcgtcctcaccgtctgcaccaggactggct

WO 2005/017148

PCT/US2003/041600

gaatggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaaccatctccaagccaaagggc
agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgca
aaggcttctatccaagcgacatcgccgtggagtgaggagcaatggcgagccggagaacaactacaagaccacgctcccggtg
ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
5 cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence:

MDSQAQVLMLLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLA WYQQIPGQSPKLLIY WASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
10 VYYCQQYYTYPTFGGGTKLEIKGGGSGGGGSGGGGSSQVQLKESGPGLVAPSQ
SLSITCTVSGFSLTVYGVNWRQPPGKGLDWLGMIWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTD TARYYCARDHYGTHYAMDYWGQGTSVTVSSDQEPK
SSDKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKF
NWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKA
15 LPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESN
GQPENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQ
KSLSLSPGK

61. FC2-2 VHL11S (SSS-S)H WCH2 WCH3

20 Nucleotide sequence:

gttgtaagcttgcgccatggattcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtcagtcagagcctttatataatcacat
caaaagaactacttggcctggtaccagcagataccagggcagctctctaaactgctgatttactgggcatccactagggaatctgg
ggtccctgatcgcttcacaggcagtgatctgggacagattcactctcaccatcagcagagtgaaggctgaagacctggcagttta
25 ttactgtcagcaataattatctatcctccacgttcggaggtggcaccaagctggaataaaagggtggcgggtggctcggcggtg
gtgggtcgggtggcggggagctctcaggtgcagtggaaggagtcaggacctggctcgggtggcgccctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatggtgtaactgggttcgccagcctccaggaaagggtctggactggctgg
gaatgatattgggtgatggaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gtttcttaaaatggacagtctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
30 actactggggtaaggaacctcagtcaccgtctcctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcct
cagcacctgaactcctgggtggaccgtcagctctcctctcccccaaaacccaaggacacctcatgatctcccgaccctgag
gtcatatcggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
gccaaagacaaagccgcgggagagcagtaacagacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactgggt
gaatggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaaccatctccaagccaaagggc
35 agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgacctgctgca
aaggcttctatccaagcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgctcccggtg
ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

40 Amino acid sequence:

MDSQAQVLMLLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLA WYQQIPGQSPKLLIY WASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
45 VYYCQQYYTYPTFGGGTKLEIKGGGSGGGGSGGGGSSQVQLKESGPGSVAPSQ
SLSITCTVSGFSLTVYGVNWRQPPGKGLDWLGMIWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTD TARYYCARDHYGTHYAMDYWGQGTSVTVSSDQEPK
SSDKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKF
NWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKA
LPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESN
GQPENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQ
50 KSLSLSPGK

WO 2005/017148

PCT/US2003/041600

62. UCHL-1 VH

Nucleotide sequence:

atgggcaggcttacttctcattctgctactgattgttctgcataatgtcctctcccagattactctgaaagagcttgccctgggactct
gcagccctcccagaccctcagctgactgttcttctctgggtttcactgaccattatggtataggagtaggttgattcgtcagcct
5 ccaggggaagggtctggagtggtgacacacatttggtggaatgataataagtactataacacagccctgaggagccggctcaca
tctccaaggattcctccaacaaccaagtactcctcaagatgccaatgtggacactgcagataccgccacatactactgtctctacg
gctacacttactggggccaaggactctggctactgtctctgca

Amino acid sequence:

10 MGRLTSSFLLIVPAYVLSQITLKESGPGILQPSQTLSTCSFSGFSLTTYGIGVGWIR
QPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNNQVLLKIANVDTADTAT
YYCLYGYTYWGQGLTVTSA

63. UCHL-1 VL

Nucleotide sequence:

atgaagtgcctgtaggctgttggtgctgatgttctggattcctgcttccatcagtgatgttgatgacccaaactccactctccctgc
ctgtcagctctggagatcaggccctccatctcttcgagatctagtccagagcctctttacagtaatggaacacattttacattggtacct
gcagaagccaggccagctccaaaactcctgatctacaaactttccaaccgattttctgggggtcccagacaggttcagtggtcagtggt
20 atcaggagacagattcacactcaagatcagcagagtgaggctgaggatctgggagttatttctgctctcaaagtacacatgttccg
tggacgttcggtggaggcaccagctggaatcaaa

Amino acid sequence:

25 MKLPVRLVLMFWIPASISDVVMTQTPLSLPVS LGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGV PDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIK

64. UCHL-1 scFv

Nucleotide sequence:

gttgtaagcttgccgcatgaagtgcctgtaggctgttggtgctgatgttctggattcctgcttccatcagtgatgttgatgaccc
30 aaactccactctccctgcctgtcagctctggagatcaggccctccatctctgcagatctagtccagagcctctttacagtaatggaac
acctatttaccattgtacctgcagaagccaggccagctcctccaaaactcctgatctacaaactttccaaccgattttctgggggtcccaga
caggttcagtggtcagtgatcaggagacagattcacactcaagatcagcagagtgaggctgaggatctgggagttatttctgctc
tcaaagtacacatgttccgtggacgttcggtggaggcaccagctggaatcaagatggcgggtggctcggcggtggtggatct
ggaggaggtgggagctctcagattactctgaagagcttgccctgggattcttcagccctcccagaccctcagctgactgttctt
35 tctctgggtttcactgaccattatggtataggagtaggttgattcgtcagcctccagggaagggtctggagtggtgacacacat
tgggtggaatgataataagtactataacacagccctgaggagccggctcacaatctcaagattctccaacaaccaagtactcct
caagatgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtca
ctgtctctgctgatca

40 Amino acid sequence:

MKLPVRLVLMFWIPASISDVVMTQTPLSLPVS LGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGV PDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGILQPSQTLSTCS
FSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
45 QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTSAD

65. UCHL-1 VH I11SL12S

Nucleotide sequence:

50 gggagctctcagattactctgaaagagcttgccctgggactcttcagccctcccagaccctcagctgactgttcttctctgggtt
tcactgaccacttatggtataggagtaggttgattcgtcagcctccagggaagggtctggagtggtgacacacatttggtggaat

WO 2005/017148

PCT/US2003/041600

gataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactcctcaagatcgc
caatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaaggactctggtcactgtctctgct
gatca

5 Amino acid sequence:
(GSS)QITLKESGPGSSQPSQTLSTCSFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIW
WNDNKYYNTALRSRLTISKDSSNNQVLLKIANVDTADTATYYCLYGYTYWGQGT
LVTVSAD

10

66. UCHL-1 scFv VH L11S

Nucleotide sequence:

gttgtaagcttcccgcctgaagttgcctgttaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
aaactccactctccctgcctgtcagctctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaatgaaac
15 acctattacattggtacctgcagaagccaggccagctctccaaaactcctgatctacaaactttccaaccgattttctggggtcccaga
cagggtcagtggtgagtcagggacagatttcacactcaagatcagcagagtgaggctgaggatctgggagtttattctgctc
tcaaagtacacatgttccgtggacgttcggtggaggccaccaagctggaaatcaaagatggcgggtggctcgggcgggtggtgatct
ggaggaggtgggagctctcagattactctgaaagagcttgccctgggagctccagccctcccagaccctcagctgactgttct
ttctctgggttttactgaccacttatggtataggagtaggttggttcgctcagcctccagggaagggtctggagtggctgacacac
20 atttggtggaatgataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactc
ctcaagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtc
actgtctctgctgatca

Amino acid sequence:

25 MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGSSQPSQTLSTC
SFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
QVLLKIANVDTADTATYYCLYGYTYWGQGT LVTVSAD

30

67. UCHL-1 scFv (SSS-S)H WCH2 WCH3

Nucleotide sequence:

gttgtaagcttcccgcctgaagttgcctgttaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
35 aaactccactctccctgcctgtcagctctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaatgaaac
acctattacattggtacctgcagaagccaggccagctctccaaaactcctgatctacaaactttccaaccgattttctggggtcccaga
cagggtcagtggtgagtcagggacagatttcacactcaagatcagcagagtgaggctgaggatctgggagtttattctgctc
tcaaagtacacatgttccgtggacgttcggtggaggccaccaagctggaaatcaaagatggcgggtggctcgggcgggtggtgatct
ggaggaggtgggagctctcagattactctgaaagagcttgccctgggagctctgcagccctcccagaccctcagctgactgttctt
40 tctctgggttttactgaccacttatggtataggagtaggttggttcgctcagcctccagggaagggtctggagtggctgacacacat
ttggtggaatgataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactcct
caagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtca
ctgtctctgctgatcaggagcccaatctctgacaaaactcacacatcccaccgtcctcagcacctgaactcctgggtggaccgt
cagttctctcttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcacatgcgtggtggtggacgtgagc
45 cacgaagaccctgaggtcaagttcaactgtgactggacggcgtggaggtgcataatgccagacaaagccgcgggaggagga
gtacaacagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccagactggctgaatggcaaggagtacaagtgcaaggtc
tccaacaaagccctcccagccccatcgagaaaacctctcaaagccaaaggcagccccgagaaccacaggtgtacacct
gccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaggctctatccaagcgacatcgccgtg
gagtgaggagagcaatgggcagccggagacaactacaagaccacgcctcccgctggtgactccgacggtccttctctctac
50 agcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctcctgatgatgaggtctgcacaaccact
acacgcagaagagcctctccctgtctccgggtaaatgatctaga

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWY LQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
5 QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGILQPSQTLSTLCS
FSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTVSADQEPKSSDKTHTSPSSAP
ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNA
KTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ
10 PREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPVL
DSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

68. UCHL-1 scFv VHL11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

gttgtaagctgccgccatgaagtgccctgtaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
aaactccactctccctgctgctcagtcctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaaatgaaac
acattattacattggtacctgcagaagccaggccagctcctcaaaactcctgctacaaactttcaaccgattttctggggtccaga
cagggtcagtggtgagtcagggacagatttcacactcaagatcagcagagtgagggtgaggtctgggagttatttctgctc
20 tcaaagtacacatgttccgtggacgttcgggtggagccaccaagctggaaatcaaagatggcgggtggtcggcggtggtggtgatc
ggaggaggtgggagctctcagattactctgaaagagctctggcctgggagctcccagccctccagaccctcagctcactgttct
ttctctgggttttactgaccacttatggtataggagtaggttggtcgtcagcctccagggaagggtctggagtggtgacacac
atttggtggaatgataataagtactataacacagccctgaggagccggctcacaatctcaaggattcctccaacaaccaagtac
ctcaagatcgccaatgtggacactgcagataccgccacatactactgtctacggctacacttactggggccaagggactctggtc
25 actgtctctgctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaactcctgggtggaccg
tcagtcttctcttcccccaaaaccaaggacaccctcatgatctccggaccctgaggctacatgctggtggtggtgacgtgag
ccacgaagaccctgagggtcaagttcaactgtgtgacgtggagccggtggaggtgcataatgccagacaaagccgcgggaggagc
agtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgaaggt
ctccaacaaagccctccagccccatcgagaaaacatctccaaagccaaaggcagccccgagaaccacaggtgtacaccc
30 tgcctccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaaggcttctatccaagcagacatcgccgt
ggagtgaggagcaatgggcagccgggagacaactacaagaccagcctccctgctggtgactccgacggctccttctctctta
cagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgcatgaggtctgcacaacca
ctacacgcagaagacgtctcctgtctccgggtaaatgatctagaa

Amino acid sequence:

MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWY LQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGSSQPSQTLSTLCS
SFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
40 QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTVSADQEPKSSDKTHTSPSSAP
ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNA
KTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ
PREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPVL
DSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

45

69. 5B9 VH L11S

Nucleotide sequence:

gggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcagagacctgtccatcacctgcacagtctctg
gtttctattaactacatgctgtacactgggttcgacgtctcaggaaagggtctggagtggtgggagtgatgagtggtggtg
50 aatcacagactataatgcagcttcatatccagactgagcatcaccaaggacattccaagagccaagtttcttaaaatgaacagtc

WO 2005/017148

PCT/US2003/041600

tgcaacctaataacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatggactactgggggtcaa
ggaacctcagtcaccgtctcctcag

Amino acid sequence:

5 (GSS)QVQLKQSGPGSVQSSQSLSTCTVSGFSLTTYAVHWVRQSPGKGLEWLGVI
WSGGITDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDAIYYCARNGGDNYPPY
YAMDYWGQGTSTVTVSS

10 73. 5B9 VH L11S scFv

Nucleotide sequence:

aagcttcccgcacagaggttctctgctcagcttctgggggtgcttctgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaatggcatca
cttatttgatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctggcctcaggagtcacagaca
15 gggtcagtagcagtggtcaggaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttactactgtgctc
aaaatctagaacttccgctcagcttctgggtgctgggaccaagctggagctgaaacgggggtggcgtggctcgggcgggtgggtgggt
cgggtggcggcgggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcacagagcctgtccatcacct
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atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctt
20 aaaatgaacagcttgcacctaataacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactggggtaaggaacctcagtcaccgtctcctcag

Amino acid sequence:

MRFSAQLLGLLVLPWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLLSHNGITY
25 LYWYLQKPGQSPQLLIYQMSNLSAGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGGSGGGGSSQVQLKQSGPGSVQSSQSLSI
TCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSKS
QVFFKMNSLQPNDAIYYCARNGGDNYPPYYAMDYWGQGTSTVTVSS

30

70. 5B9 scFv VHL11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttcccgcacagaggttctctgctcagcttctgggggtgcttctgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaatggcatca
35 cttatttgatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctggcctcaggagtcacagaca
gggtcagtagcagtggtcaggaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttactactgtgctc
aaaatctagaacttccgctcagcttctgggtgctgggaccaagctggagctgaaacgggggtggcgtggctcgggcgggtgggtgggt
cgggtggcggcgggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcacagagcctgtccatcacct
gcacagctctctggttctcattaactacatgctgtacactgggttcgccagctcctcaggaaagggtctggagtggctgggagtgat
40 atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctt
aaaatgaacagcttgcacctaataacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatgga
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agcactgaactcctgggtggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggacctcagg
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45 caagacaaagccgggaggagcagtagcaacagcagctaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctga
atggcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaaccatctccaagccaaggagcag
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ggactccgagggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggaacgtcttctatgctcc
50 gtgatgcatgaggctctgcacaaccactacacgcagaagacgtctcctctgtccgggtaaatgatctagag

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSGITY
LYWYLQKPGQSPQLLIYQMSNLAGVPDFRFSSTSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGGSGGGSSQVQLKQSGPGSVQSSQSLSI
5 TCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSKS
QVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSTVTVSSDQEPKSS
DKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPPEVTCVVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP
10 ENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLS
LSPGK

15 **76. 2H7 scFv VH L11S (SSS-S)H P238SCH2 WCH3**

Nucleotide sequence:

aagcttgcgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
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taaccacccacgttcggtgctgggaccaagctggagctgaagatggcggctggcggctgggctggatctggagggagtg
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tacacattaccagttacaatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
gggtatacttctcacaatcagaagttcaaggccaaggccactgactgtagacaaatctccagcacagcctacatgcagctcag
25 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaacttactggtacttcgatgctggggcac
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cgcgaggaggagcagtacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaaggag
30 tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaacc
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gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaactctctcatgctccgtgatgcatgag
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35

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILASPGKEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWIYAPSNLAGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
40 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGSSVFLFPPKPKDTLMISRTPPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
45 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

78. 2H7 scFv VH L11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

50 aagcttgcgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggcacaatgacttgcagggccagctcaagtgttaagtacatgcact

WO 2005/017148

PCT/US2003/041600

ggtaccagcagaagccaggatcctccccc aaacctggattatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggacctcttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggtggctcggcggtgggtgatctggaggaggtg
ggagctctcaggcttactacagcagctcgggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
5 tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
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agggaccacggtcaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcctcagcacctgaact
cctgggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
10 tgggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaaagc
cgcgaggaggagcagtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
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agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgctcccggtgctggactccgacg
15 gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
20 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
25 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

30

79. 2H7 scFv VH L11S (CSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttgcgccatgatttcaagtgcagatttcagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctcagcaatcctgtctgcactcaggggagaaggtcacaatgactgcaggccagctcaagtgttaattacatgcact
35 ggtaccagcagaagccaggatcctccccc aaacctggattatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggacctcttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggtggctcggcggtgggtgatctggaggaggtg
ggagctctcaggcttactacagcagctcgggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
40 ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgctcggggcac
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tggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaaagc
45 cgcgaggaggagcagtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
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gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
50 gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga